

IMPERIAL COUNTY AIR POLLUTION CONTROL DISTRICT



**December 16, 2016
Exceptional Event Documentation
For the Imperial County PM₁₀ Nonattainment Area**

FINAL DRAFT
December 11, 2018

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ACRONYM DESCRIPTIONS

AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration

nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service
PDT	Pacific Daylight Time
PM ₁₀	Particulate Matter less than 10 microns
PM _{2.5}	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On December 16, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 06-025-0007), Calexico (AQS Site Code 06-025-0005), El Centro (AQS Site Code 06-025-1003), Niland (AQS Site Code 06-025-4004), and Westmorland (AQS Site Code 06-025-4003), California, measured exceedances of the National Ambient Air Quality Standard (NAAQS). The Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM₁₀) concentrations of 645 µg/m³, 238 µg/m³, 207 µg/m³, 530 µg/m³, 733 µg/m³ (**Table 1-1**). PM₁₀ 24-hr measurements above 150 µg/m³ are exceedances of the NAAQS. All five of the SLAMS located in Imperial County measured exceedances of the PM₁₀ NAAQS on December 16, 2016.

TABLE 1-1
CONCENTRATIONS OF PM₁₀ ON DECEMBER 16, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m ³	PM ₁₀ NAAQS µg/m ³
12/16/2016	Brawley	06-025-0007	3	24	645	150
12/16/2016	Calexico	06-025-0005	3	24	238	150
12/16/2016	El Centro	06-025-1003	4	24	207	150
12/16/2016	Niland	06-025-4004	3	24	530	150
12/16/2016	Westmorland	06-025-4003	3	24	733	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted¹

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM₁₀ data from FRM SSI instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM₁₀ data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM₁₀ data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM₁₀ data since 2013 is regulatory. On December 16, 2016, the Brawley, Calexico, El Centro, Niland, and Westmorland monitors were impacted by elevated particulate matter caused by the entrainment of fugitive windblown dust from high winds associated with an intense low-pressure system that moved through southern California during December 16, 2016.

This report demonstrates that the exceedances observed on December 16, 2016 were caused

¹ According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use the designation can be left off inferring "local time" daylight or standard whichever is present. For 2015 Pacific Daylight Time (PDT) is March 8 through October 31. <https://www.nist.gov/pml/time-and-frequency-division/local-time-faq#intl>

by a naturally occurring event which elevated particulate matter which affected air quality, which has concentration to concentration monitoring site analyses supporting the clear causal relationship between the event and the monitored exceedances, was not reasonably controllable or preventable (nRCP), and would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert to the west of Imperial County. The document further substantiates the request by the ICAPCD to exclude PM₁₀ 24-hour NAAQS exceedance of 645 µg/m³, 238 µg/m³, 207 µg/m³, 530 µg/m³, 733 µg/m³ (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER).²

I.1 Demonstration Contents

Section II - Describes the December 16, 2016 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley station this section discusses and establishes how the December 16, 2016 event affected air quality such that a clear causal relationship is demonstrated between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM₁₀ data measured in both local conditions and standard conditions. Measured PM₁₀ continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the December 16, 2016 event and its resulting emissions defining the event as a “natural event”.³

Section IV - Provides evidence that the event of December 16, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

² "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

³ Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD and the National Weather Service (NWS) provided an extended week-to-weekend notification via the ICAPCD's webpage on Tuesday, December 13, 2016 explaining that a deep trough of low pressure would move through the region during Thursday, December 15, 2016 and Friday, December 16, 2016, creating a strong onshore flow and gusty west-to-southwesterly winds across southeast California. Weather Stories issued by the NWS and Phoenix offices that forecasted a large storm moving through southern California were posted on the ICAPCD website beginning December 13, 2016 and continued through Friday, December 16, 2016. That day the ICAPCD posted on its website a Weather Briefing issued by the NWS Phoenix office notifying the public that strong gusty winds of 20-35 mph with gusts over 40 mph would affect southeast California and southwest Arizona. Blowing dust was expected.

On December 15, 2016 a Wind Advisory was issued for Imperial County in anticipation of the approaching storm. Westerly winds of 25 to 40 mph were expected with gusts reaching 50 mph. Hazardous driving conditions due to cross winds and dense blowing dust and sand was expected. The advisory was in effect from 4 a.m. to 8 p.m. on Friday, December 16, 2016. The expected magnitude of the storm prompted the NWS San Diego office to issue a High Wind Watch for a large area including the San Diego deserts effective December 15, 2016 through December 16, 2016. Damaging winds were expected along the mountain ridge tops to the desert floor. Winds were forecasted to reach 40 mph with gusts of 75 mph in the mountains and 60 mph on the desert floor. Blowing sand and dust was expected to reduce visibility. These desert areas were immediately upstream of Imperial County on December 16, 2016.

Due to the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County December 16, 2016. On December 15, 2016 the ICAPCD posted an air quality forecast on its website that advised gusty west-southwesterly winds would lead to areas of blowing dust resulting in reduced air quality in Imperial County. **Appendix A** contains copies of pertinent notices to the exceptional event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. The notification is accomplished by flagging the data in AQS and providing an initial event description.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an “Initial Notification of Potential Exceptional Event” (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM₁₀ concentrations from the Brawley, Calexico, El Centro, Niland, and Westmorland monitors on April 17, 2017. The INPEE, for the December 16, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent to CARB requesting preliminary flags on additional days during 2016. **Table 1-1** above provides the PM₁₀ measured concentrations for all monitors in Imperial County for December 16, 2016. A brief description of the meteorological conditions was provided to CARB, which provided preliminary information that indicated a potential natural event had occurred on December 16, 2016.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on August 17, 2018. The notice advised the public that comments were being solicited regarding this demonstration, which supports the request, by the ICAPCD, to exclude the measured concentrations of 645 µg/m³ (Brawley), 238 µg/m³ (Calexico), 207 µg/m³ (El Centro), 530 µg/m³ (Niland) and 733 µg/m³ (Westmorland) which occurred on December 16, 2016 (**Table 1-1**). The final closing date for comments was September 17, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the December 16, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM₁₀ State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

- A This demonstration provides evidence that the event, as it occurred on December 16, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.
 - a The event created the meteorological conditions that entrained emissions and caused the exceedance.
 - b The event clearly “affects air quality” such that there is the existence of a clear causal relationship between the event and the exceedance.
 - c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
 - d The event “is not reasonably controllable and not reasonably preventable.”
 - e The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”
 - f The event is a “natural event” where human activity played little or no direct causal role.
- B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley, Calexico, El Centro, Niland, and Westmorland.
- C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II December 16, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the December 16, 2016 event unfolded in Imperial County. The subsection elements include

- » A description and map of the geographic setting of the air quality and meteorological monitors
- » A description of Imperial County's climate
- » An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (Figure 2-1). The Colorado Desert not only includes Imperial County but a portion of San Diego County.

**FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY**



Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2**). In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA



Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6**). Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter)

mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back country with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK



Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS



Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Geronio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that affect Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT



Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY



Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south.

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

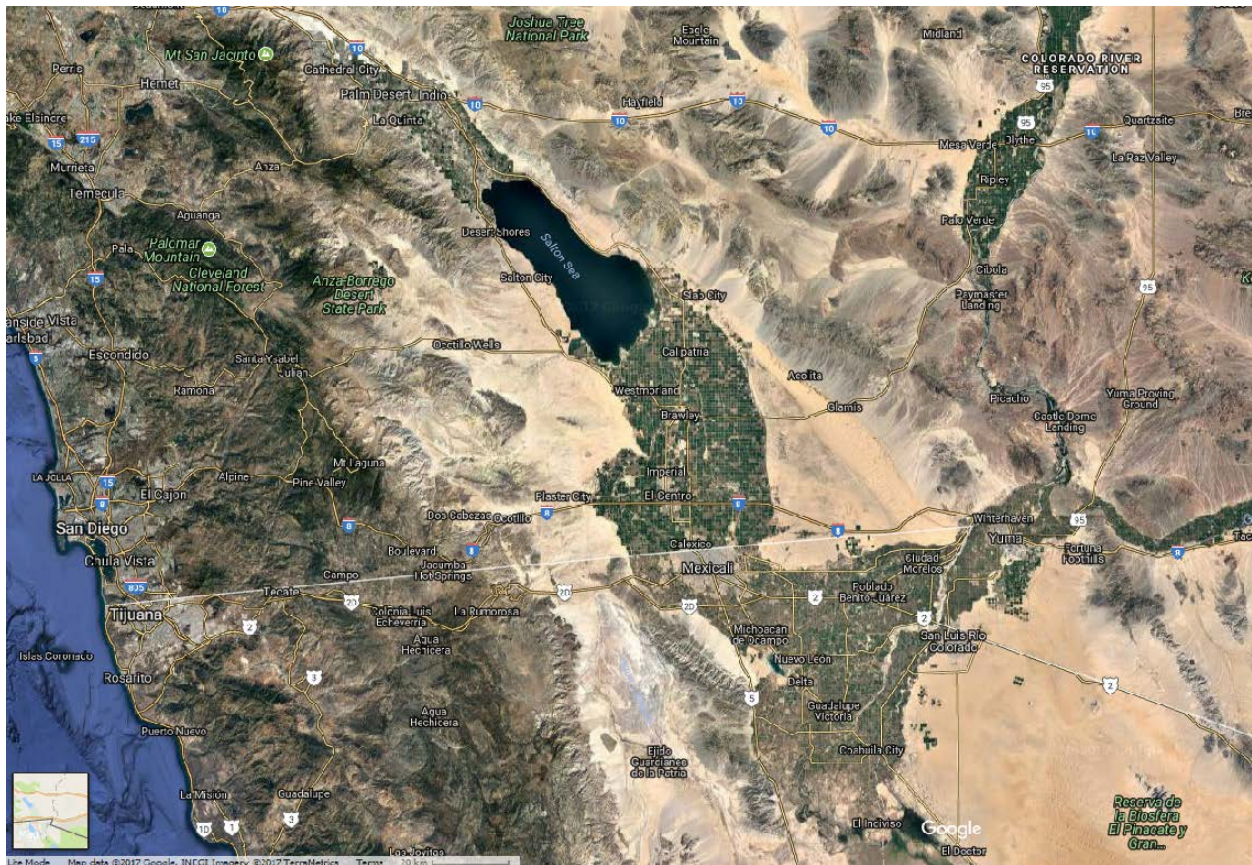


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County.

Source: Google Earth Terra Matrices.

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1**).

As mentioned above, the PM₁₀ exceedance on December 16, 2016, occurred at the Brawley station. The Brawley, Westmorland, and Niland stations are regarded as the “northern” monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on December 16, 2016, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8 and Appendix B**).

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY



Fig 2-8: Depicts a select group of PM₁₀ monitoring sites in Imperial County, eastern Riverside County, and southwestern Arizona (Yuma County). Generated through Google Earth.

In addition to meteorological sites, there are non-regulatory PM₁₀ sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062°W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593°W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and

115.62310°W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

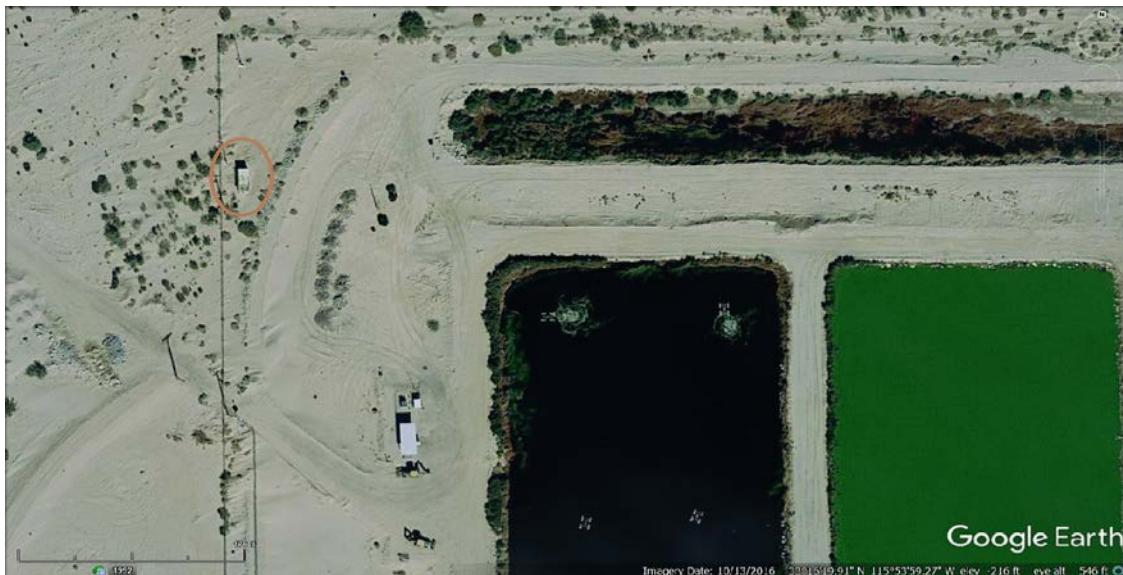


Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. Site photos can be seen at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST



Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION



Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST



Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph is taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION



Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

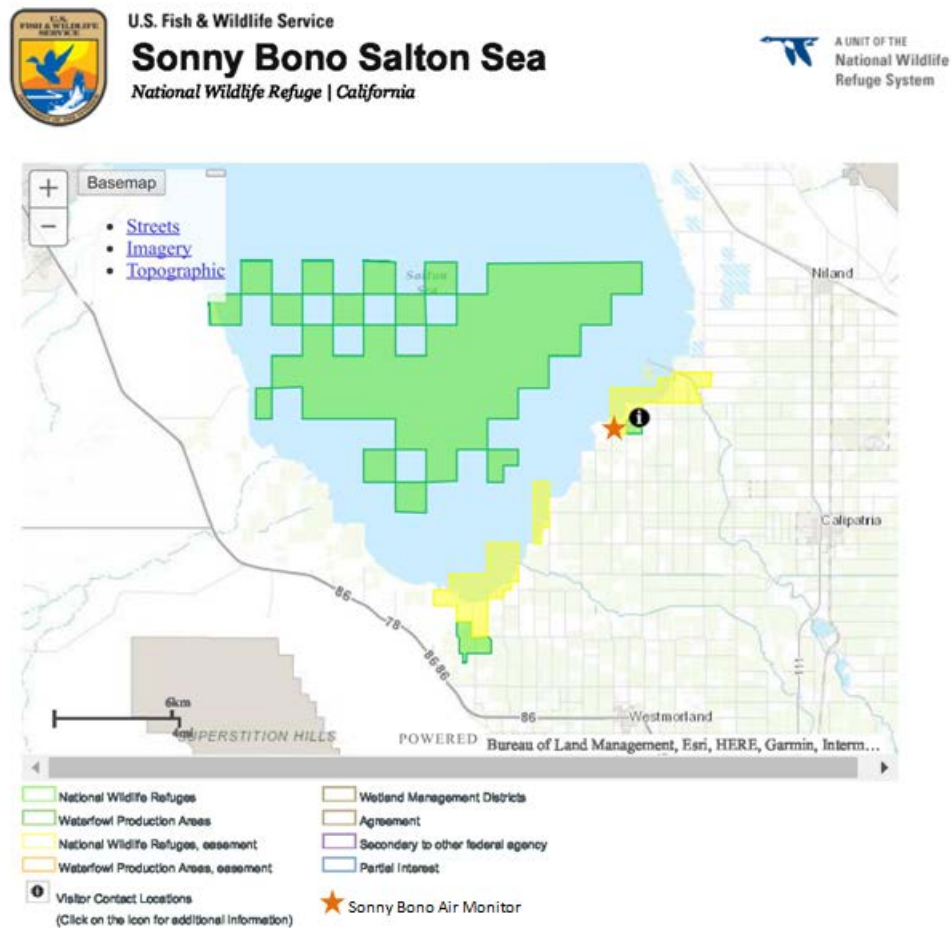


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
DECEMBER 16, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM ₁₀ (µg/m³) Avg	1-hr PM ₁₀ (µg/m³) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	-	-	-	-	-
		BAM 1020					645	917	22:00		
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	(81102)	13698	3	238	985	20:00	23.2	22:00
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	(81102)	13694	9	207	746	21:00	18.5	22:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	-	-	-	33.8	19:00
		BAM 1020					530	960	11:00		
Westmorland	ICAPCD	BAM 1020	06-025-4003	(81102)	13697	-43	733	960	07:00	20.9	21:00
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	6.5	21	18:00	11.6	14:00
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	138	764	22:00	15.5	22:00
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	523	2627	21:00	-	-

*CARB = California Air Resources Board

*ICAPCD = Air Pollution Control District, Imperial County

*SCAQMD = South Coast Air Management Quality District

*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km²). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

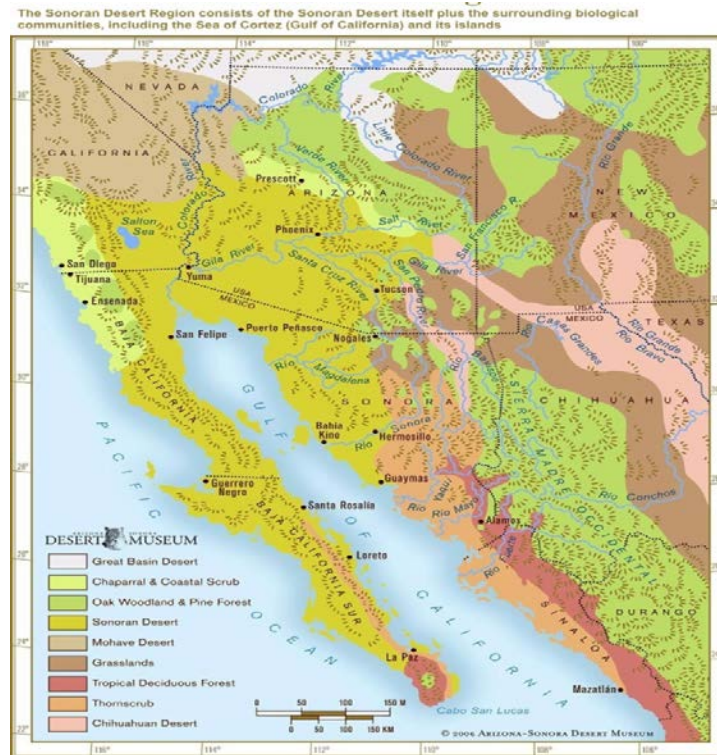


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at <http://desertmuseum.org/center/map.php>

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California—northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64" (**Figure 2-16**). During the 12-month period prior to the December 16, 2016 event, Imperial County measured a total annual precipitation of 0.9 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

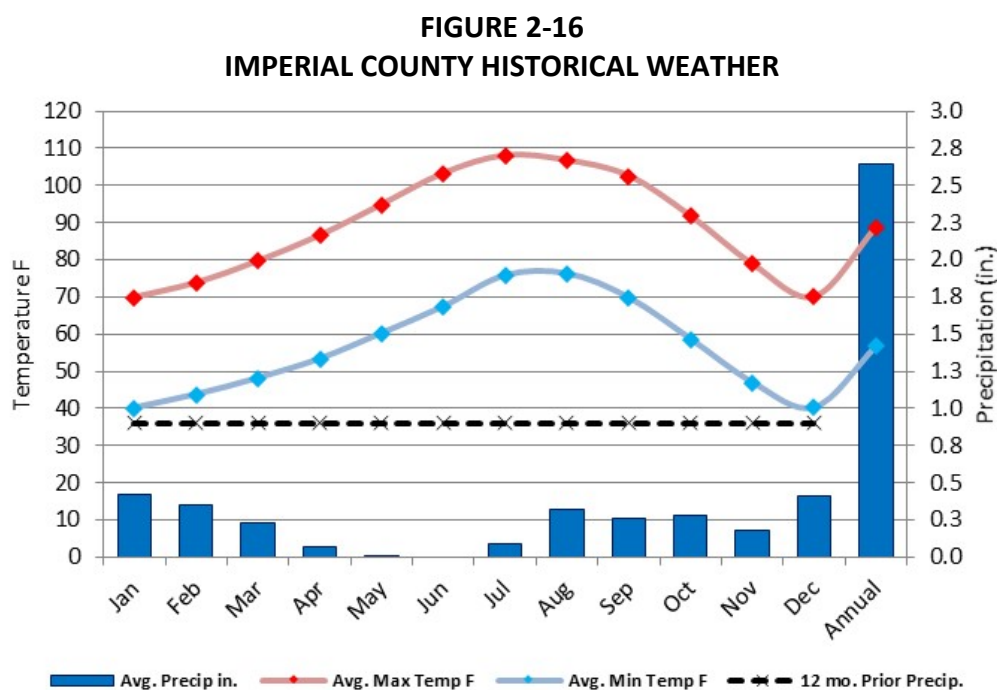


Fig 2-16: Historical Imperial County weather. In the 12 months prior to October 30, 2016, the region had suffered abnormally low total precipitation of 0.9 inches. Average annual precipitation is 2.64 inches (1932-present). Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground <http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713>

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.⁴ Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

⁴ NWS Jet Stream – Origin of Wind <http://www.srh.noaa.gov/jetstream/synoptic/wind.html>

Typically, high pressure brings clear skies and with no clouds, there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for Friday, December 16, 2016 which was caused by a large and deep trough moved inland over the western United States. The trough in turn strengthened a surface low. As the strong low-pressure system and its accompanying cold front pushed through southern California powerful winds swept across southeast California. Winds reaching 34 mph and gusts of 45 mph were measured in Imperial County. On December 16, 2016 strong westerly winds swept across southeastern California as the system moved through the region affecting air quality and causing exceedances in Brawley, Calexico, El Centro, Westmorland and Niland.

Figures 2-17 through 2-20 provide information regarding the low pressure system and the tightening of the surface gradient.

FIGURE 2-17
UPPER LEVEL TROUGH MOVES INLAND OVER WESTERN US

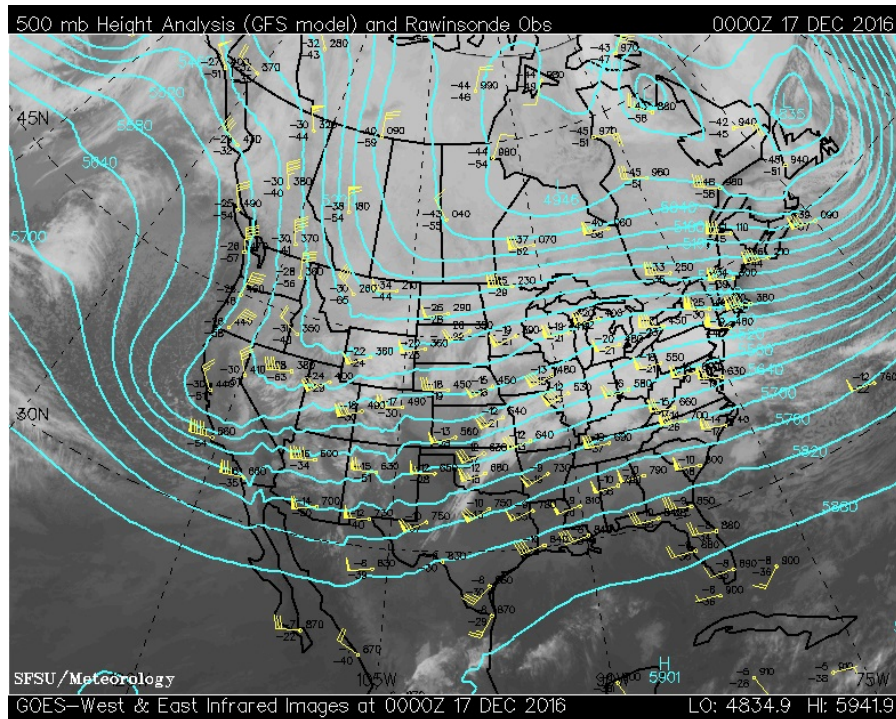
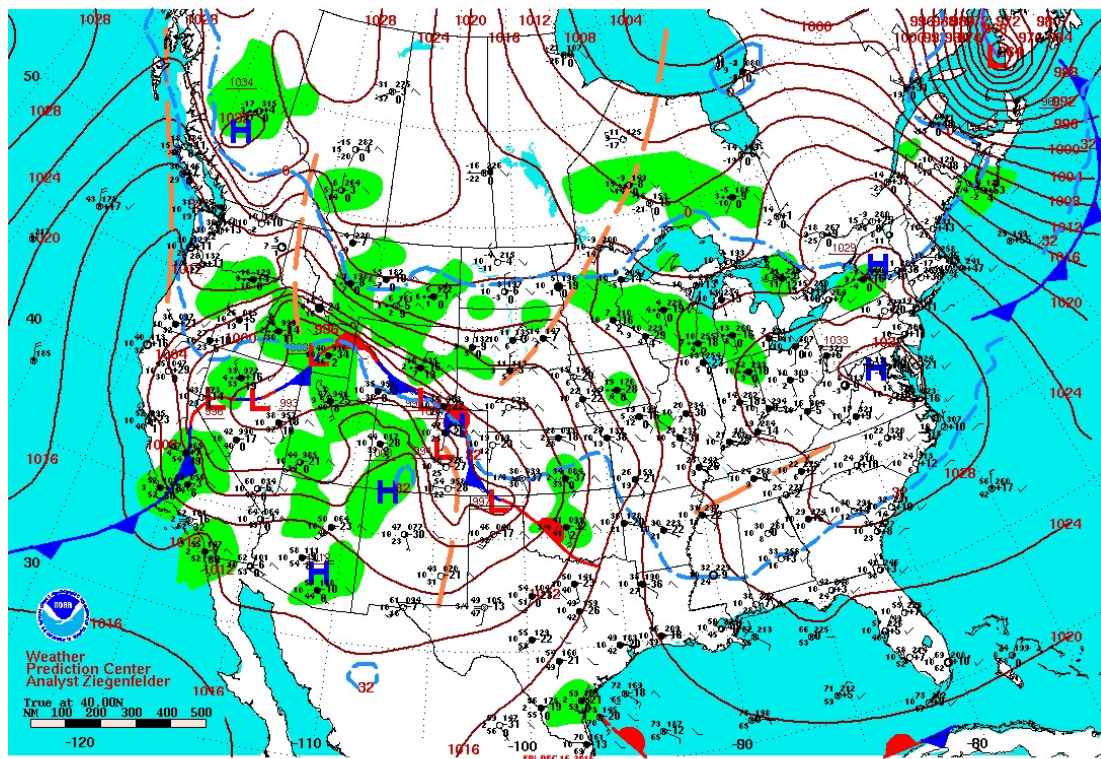


Fig 2-17: A GOES E-W infrared satellite 500mb height analysis image at 1600 PST on December 16, 2016 illustrates the trough over California and other western States. As the trough moved over California it led to the strengthening of a surface low. Source: SFSU University Department of Earth & Climate Sciences and the California Regional Weather Server; http://virga.sfsu.edu/archive/composites/sathts_snd/1612

FIGURE 2-18
SURFACE LOW STRENGTHENS OVER SOUTHERN CALIFORNIA



Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.

Fig 2-18: A Daily Surface Weather Map shows a surface low centered over Nevada along with an associated cold front. National Centers for Environmental Prediction, Weather Prediction Center;

http://www.wpc.ncep.noaa.gov/dailywxmap/dwm_stnplot_20161216.html

FIGURE 2-19
GRADIENT BECOMES PACKED ACROSS SOUTHEASTERN CALIFORNIA

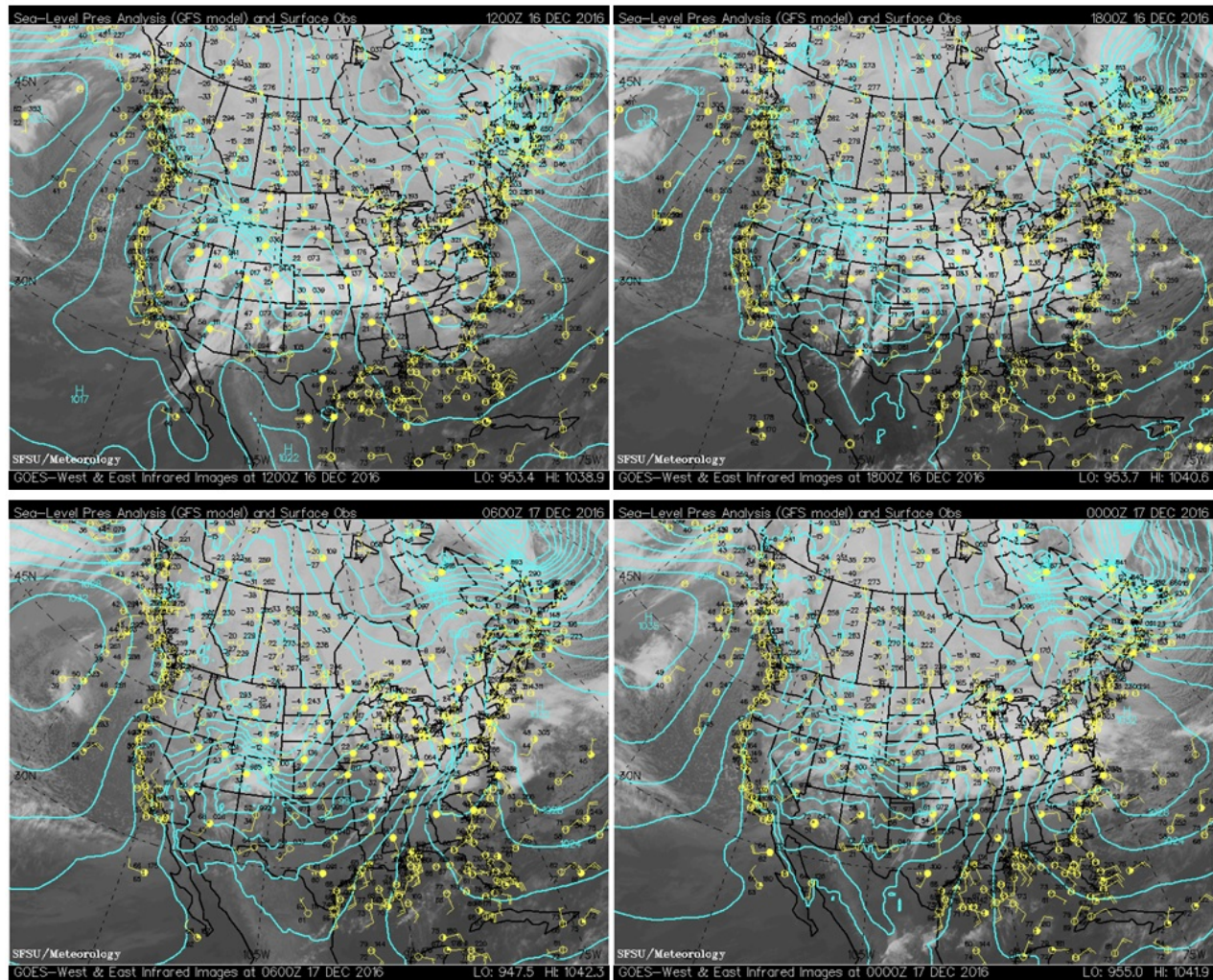


Fig 2-19: A quad of GOES E-W surface analysis images shows the gradient tightening over the course of December 16, 2016. At 0400 PST (top left) the surface low starts to strengthen. At 1000 (top right) the gradient was tightening over southeastern California. El Centro NAF (KNJK) measured winds of 34 mph with gusts of 39 mph during this period. By 1600 PST (bottom right) the gradient had tightened significantly and continued to remain packed through 2200 PST on October 16, 2016 (bottom left). During this period KNJK measured winds of 32 mph and gusts of 45mph. The packed surface gradient brought gusty winds across southeast California. Source: SFSU Department of Earth and Climate Science and the California Regional Weather Server;
http://virga.sfsu.edu/archive/composites/sathts_snd/1612

FIGURE 2-20
INCREASING WINDS ACROSS SOUTHEASTERN CALIFORNIA

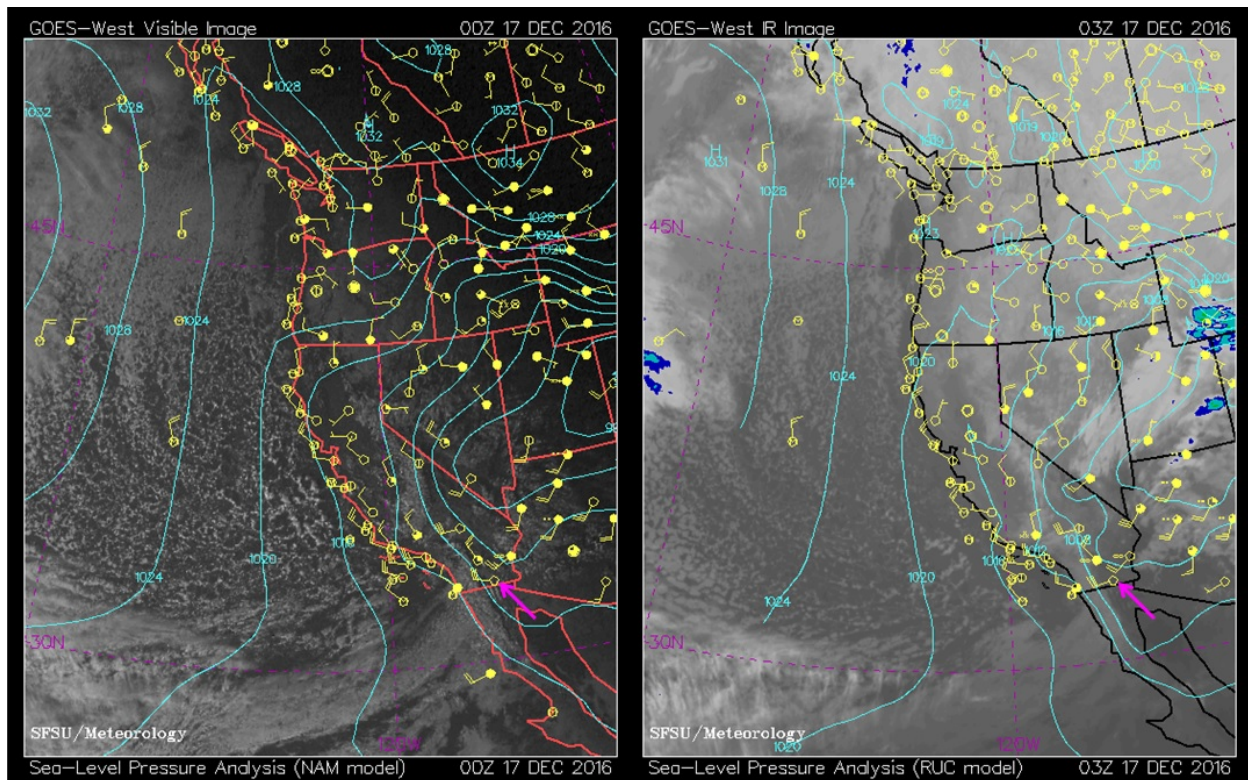


Fig 2-20: A pair of GOES-W satellite composite images show wind barbs at KNJK depicting general wind speed and direction at 1600 PST and 1900 PST on December 16, 2016. These times were during the period of some of the strongest winds at the airfield, and coincided with high hourly PM_{10} concentrations at the Brawley, Calexico, El Centro, Westmorland, and Niland monitors. Wind barbs at KNJK in a visible (left) and infrared (right) image depict winds of at least 34.6 mph at 1600 PST and 1900 PST on December 16, 2016. Source: SFSU Department of Earth and Climate Science and the California Regional Weather Server; http://squall.sfsu.edu/crws/archive/wcsathts_arch.html

Figure 2-21 is a graphical illustration of the chain of events for December 16, 2016. Based on meteorological data collected from El Centro NAF (KIPL) Imperial County Airport (KIPL), the final hours of December 15, 2016 saw a brief spurt of gusty winds from the northwest. The first two to three hours of December 16, 2016 saw moderately strong winds from the northwest as well. Winds then dipped slightly. As the system moved in winds shifted west to southwest around noon. Winds increased and powerful gusts began. Strong winds and gusts continued largely through the remainder of the day. Some upstream sites like Mountain Springs Grade on the desert slopes saw high winds and gusts continue all day long. In all, KNJK had six hours of winds at or above the 25 mph threshold, with six hours of gusts at or above 30 mph. KIPL had four hours of winds at or above the 25 mph threshold, but 10 hours of gusts at or above 31 mph.

FIGURE 2-21
RAMP-UP TO EXCEEDANCE – DECEMBER 16, 2016

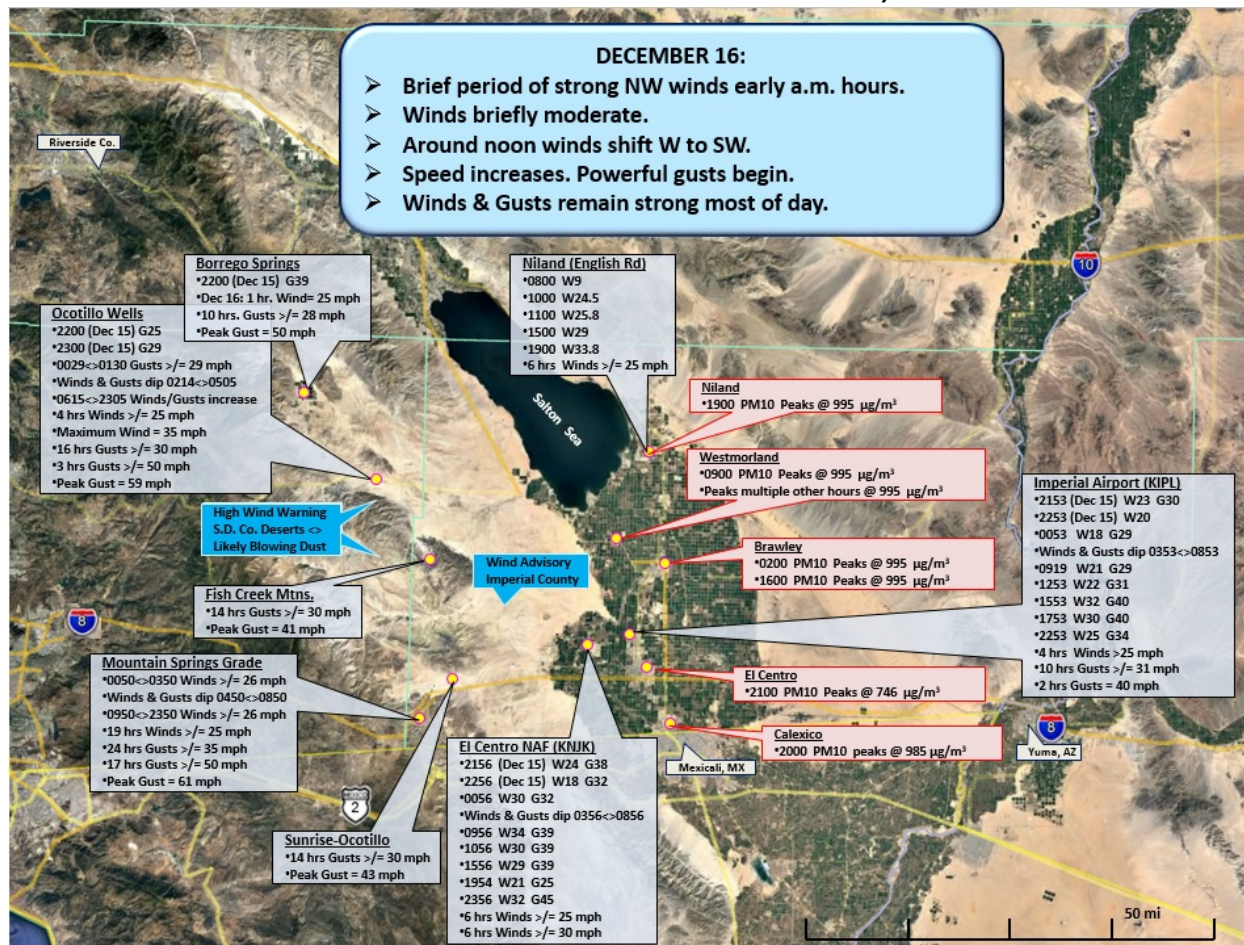


Fig 2-21: A brief spurt of gusty winds swept through Imperial County late on December 15. As the system moved in on the December 16, 2016 winds shifted from the northwest to the west and southwest around noon. Winds and gusts increased and remained strong through the day at most sites. Google Earth base map.

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali, Mexico. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON DECEMBER 16, 2016

Station Monitor	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM ₁₀ correlated to time of Max Wind Speed				
Airport Meteorological Data						Brly	CX	EC	Nlnd	Wstmld
IMPERIAL COUNTY										
Imperial Airport (KIPL)	32	280	15:53	41	18:53	405	63	237	995	995
Naval Air Facility (KNJK)	34	250	9:56	45	23:56	653	62	62	325	995
Calexico (Ethel St)	23.3	287	22:00	-	-	917	985	479	995	677
El Centro (9th Street)	18.5	262	22:00	-	-	917	985	479	995	677
Niland (English Rd)	33.8	249	19:00	-	-	-	281	186	-	-
Westmorland	20.9	279	21:00	-	-	669	-	746	926	995
RIVERSIDE COUNTY										
Blythe Airport (KBLH)	31	260	19:52	43	19:52	-	281	186	-	-
Palm Springs Airport (KPSP)	22	70	18:53	36	20:43	-	830	274	995	-
Jacqueline Cochran Regional Airport (KTRM) - Thermal	30	330	14:52	48	22:52	833	79	169	492	995
ARIZONA - YUMA										
Yuma MCAS (KNYL)	23	300	20:57	34	21:57	-	985	479	995	-
MEXICALI - MEXICO										
Mexicali Int. Airport (MXL)	40.3	270	22:43	-	-	917	985	616	995	677

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,⁵ depicted in **Figure 2-22**, indicate the path of the airflow as it approached Imperial County, affecting all five monitors, 12 hours prior to 2100 PST on December 16, 2016 coincident with the peak hourly concentration at the Calexico monitor.

The trajectories illustrate a typical scenario when west winds (airflow) funnel through the mountain passes, many times increasing in speed, and down the desert slopes of San Diego County into Imperial County. Strong westerly winds typically blow through these mountain passes and desert slopes entraining PM₁₀ across the desert floor and agricultural lands within Imperial County. On December 16, 2016 strong westerly winds blew through the San Diego mountains and desert entraining PM₁₀ across the desert floor and agricultural lands in Imperial County. It is of some worth to point out that from time to time modeled winds differ from local

⁵ The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's [MODIS](#) satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind. The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

FIGURE 2-22
HYSPLIT BACK-TRAJECTORY MODELS

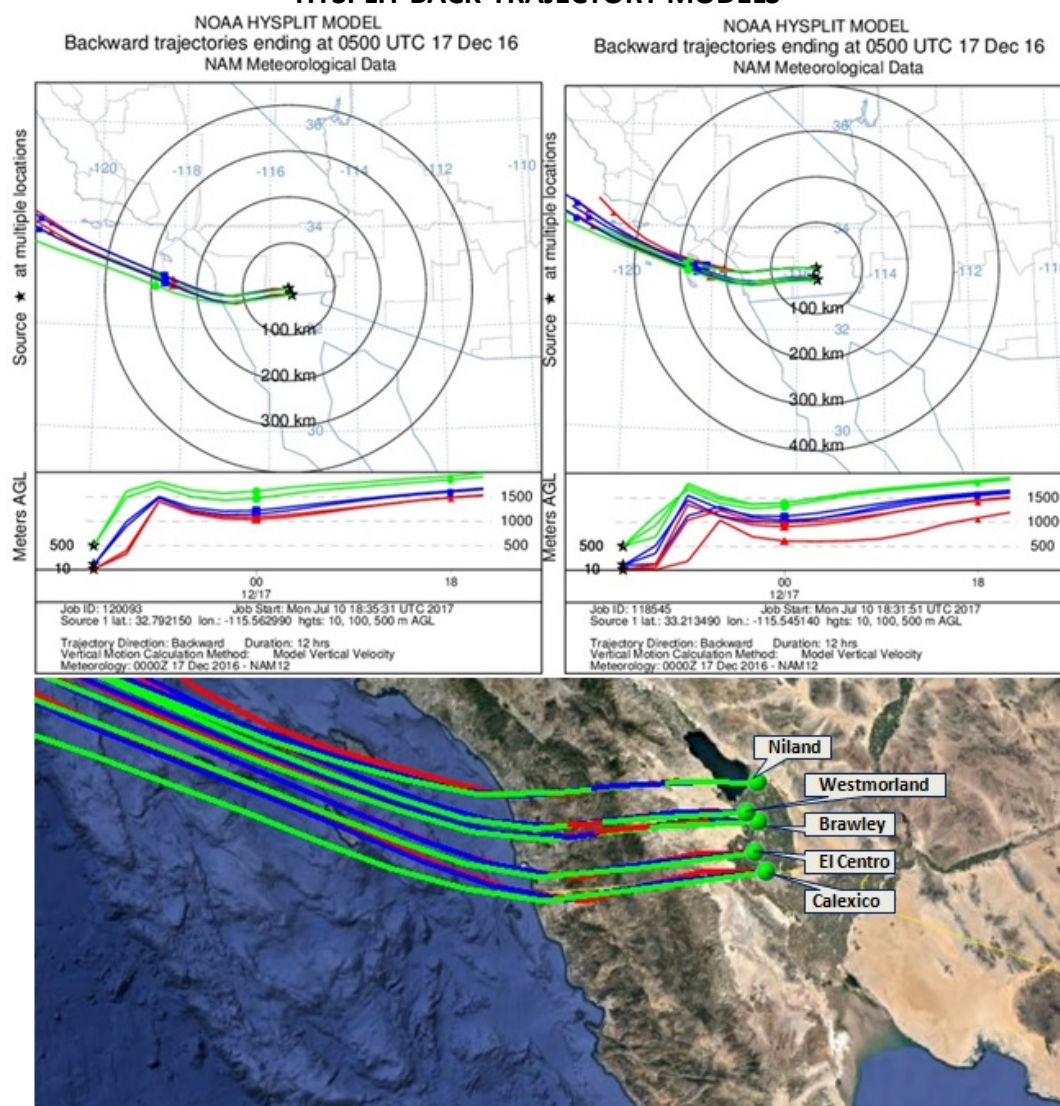


Fig. 2-22: A 12-hour back-trajectory ending at 2100 PST on December 16, 2016. Red trajectory indicates air low at 10 meters AGL (above ground level); blue indicates airflow at 100 m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 2-23 and 2-24 illustrate the wind speeds and elevated levels of hourly PM₁₀ concentrations measured in Riverside, Imperial, and Yuma counties for a total of three days, December 15, 2016 through December 17, 2016. Elevated emissions entrained into Imperial

County affected all air quality monitors in Imperial County when gusty westerly winds associated with a strong low-pressure system moved through the region. The Brawley and Westmorland monitors measured the highest elevated concentrations during the morning hours, and again in the afternoon and evening. Calexico, El Centro, and Niland measured peak hourly concentrations in the afternoon and evening. These times are coincident with elevated measured wind speeds and gusts above 25mph (see **Fig. 2-24**).

The resulting entrained dust and accompanying high winds from the system qualify this event as a “high wind dust event”.⁶ High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the December 16, 2016 high, wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

⁶ Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

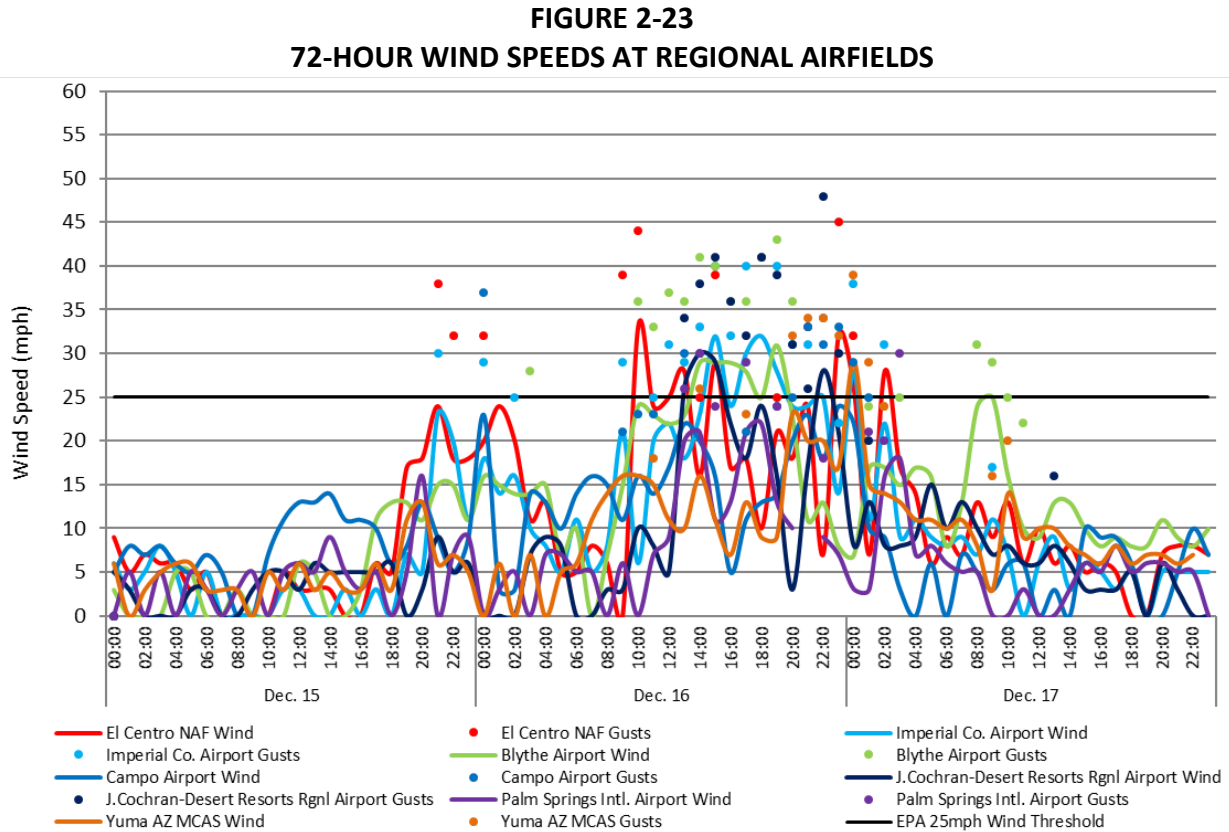


Fig 2-23: Is the graphical representation of the 72-hour measured winds speeds and gusts at regional airfields in southeast California and southwest Arizona. All regional airports and airfields depicted measured high winds and gusts during The December 16 wind event. Only Palm Springs Airport and Campo Airport barely missed measuring winds under the 25mph threshold. Winds at El Centro NAF and Imperial County Airport in Imperial County were significantly above the 25mph threshold. Due to the different times that airfields sample wind, the hour given reflects the hour in which the observation occurred, and not necessarily the exact time. Wind data from the NCEI's QCLCD system. The graph emphasizes that this was a regional event. Wind Data from the NCEI's QCLCD system

FIGURE 2-24
72-HOUR PM₁₀ CONCENTRATIONS AT VARIOUS SITES

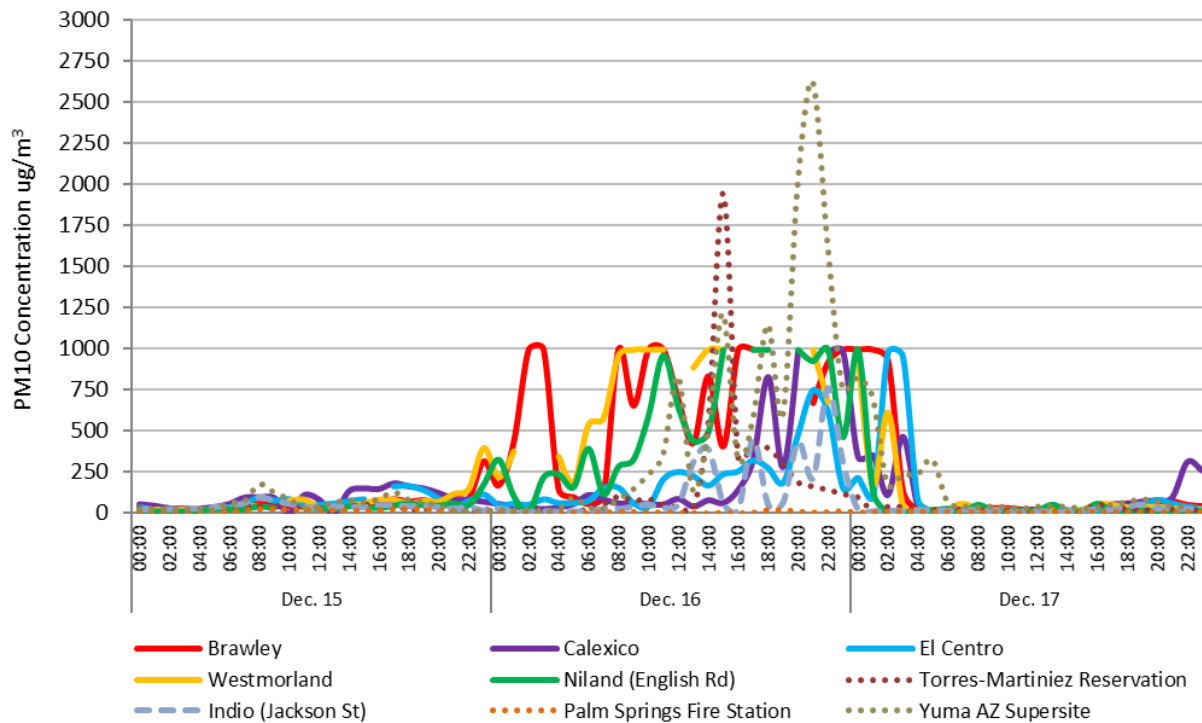


Fig 2-24: Is the graphical representation of the 72-hour relative PM₁₀ concentrations at various sites in southeast California and southwest Arizona. The elevated PM₁₀ concentrations at all sites on December 16, 2016 demonstrate the regional effect of the weather system and accompanying winds. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM₁₀ concentrations measured at the Brawley, Calexico, El Centro, Niland (English Rd), and Westmorland monitoring stations on December 16, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the December 16, 2016 high wind event and the exceedance measured at the Brawley, Calexico, El Centro, Niland (English Rd), and Westmorland monitoring stations.

Figures 3-1 through 3-10 show the time series of available FRM and BAM 24-hr PM₁₀ concentrations at the Brawley, Calexico, El Centro, Niland (English Rd), and Westmorland monitoring stations for the period of January 1, 2010 through December 16, 2016. Note that prior to 2013, the BAM data was not considered FEM and was not reported into AQS.⁷ In order to properly establish the variability of the event as it occurred on December 16, 2016, 24-hour averaged PM₁₀ concentrations between January 1, 2010 and December 16, 2016 were compiled and plotted as a time series. All figures illustrate that the exceedance, which occurred on December 16, 2016 were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs was obtained through the EPA's AQS data bank.

⁷ Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM₁₀ concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m³) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM₁₀ concentrations to PM₁₀ concentrations with in this demonstration.

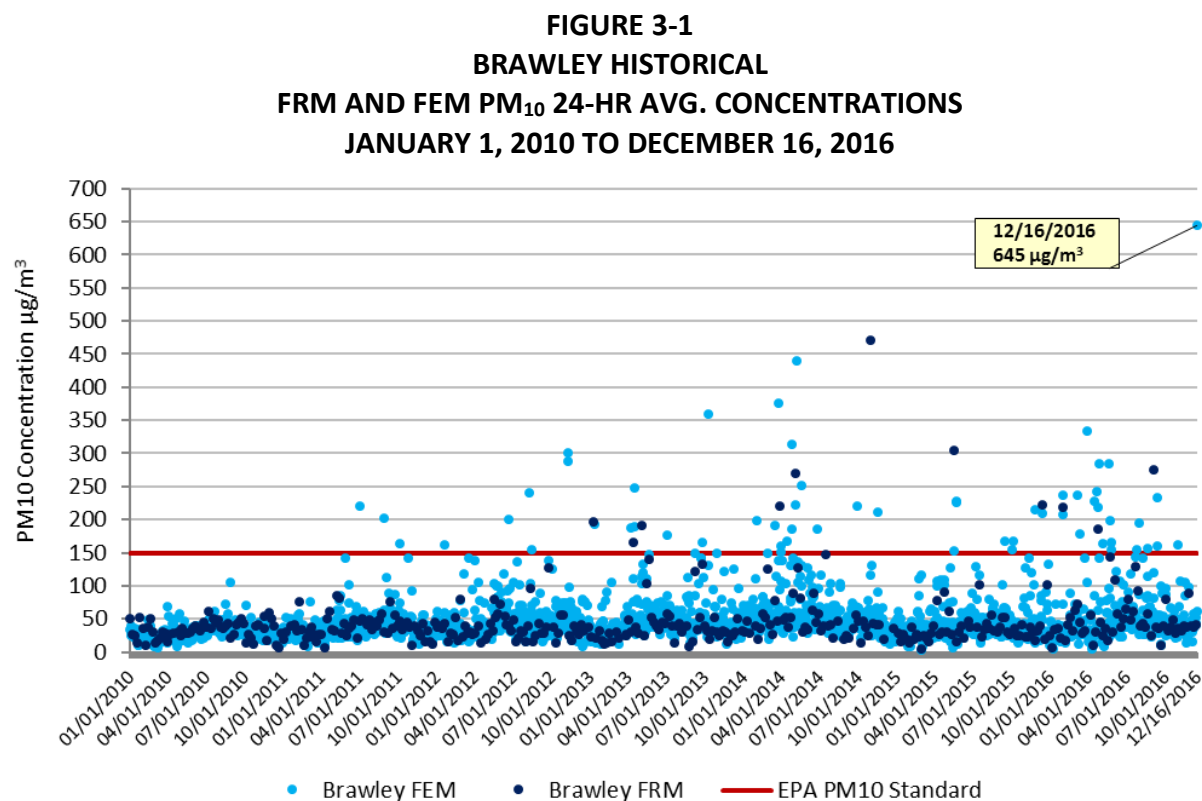


Fig 3-1: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 645 $\mu\text{g}/\text{m}^3$ by the Brawley monitor was outside the normal historical concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold

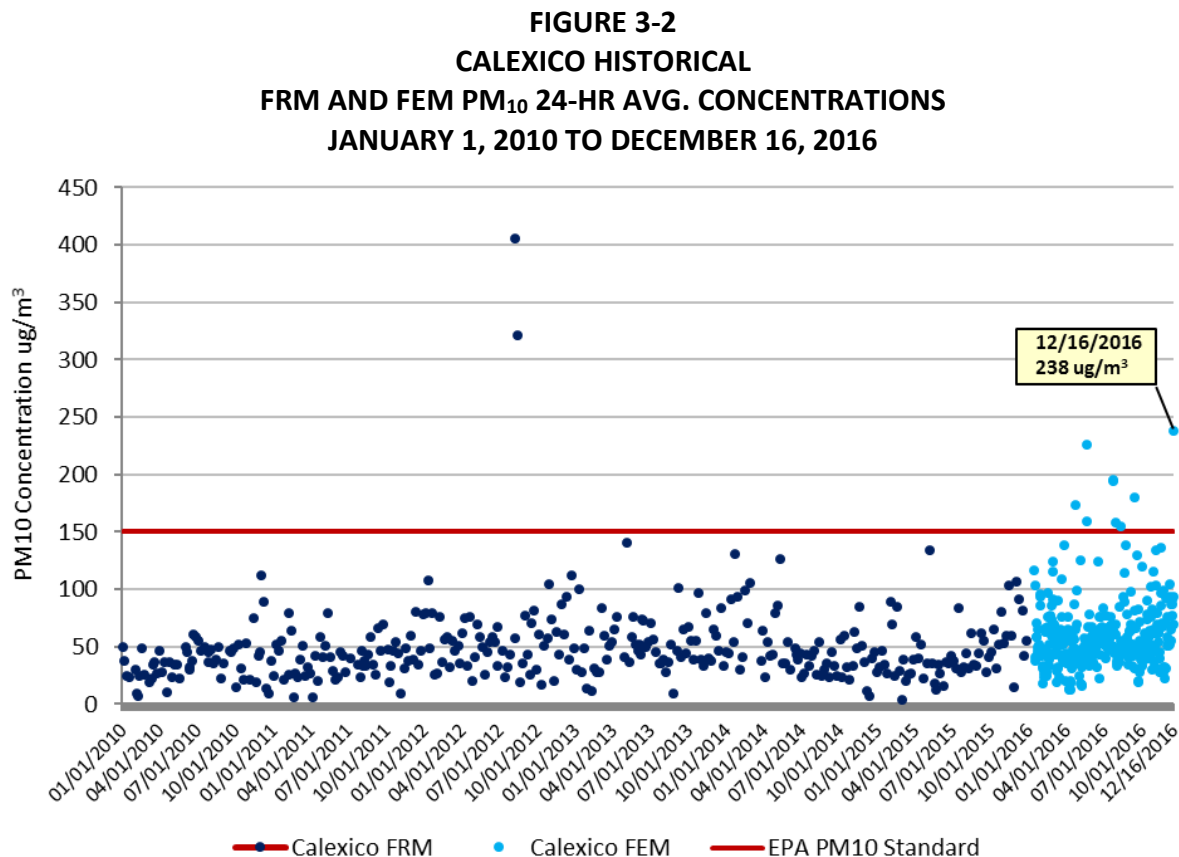


Fig 3-2: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 238 $\mu\text{g}/\text{m}^3$ by the Callexico monitor was outside the normal historical concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold

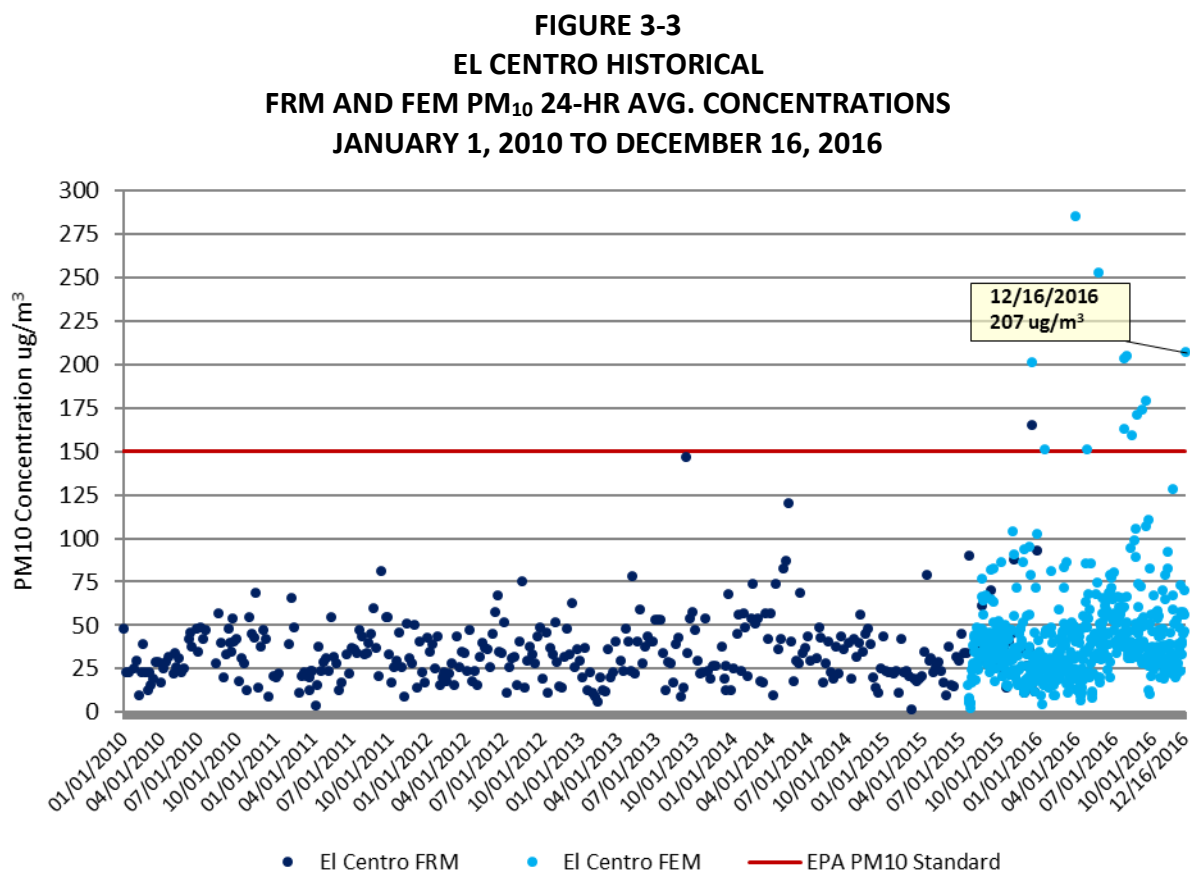


Fig 3-3: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 207 $\mu\text{g}/\text{m}^3$ by the El Centro monitor was outside the normal historical concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold

FIGURE 3-4
NILAND HISTORICAL
FRM AND FEM PM₁₀ 24-HR AVG. CONCENTRATIONS
JANUARY 1, 2010 TO DECEMBER 16, 2016

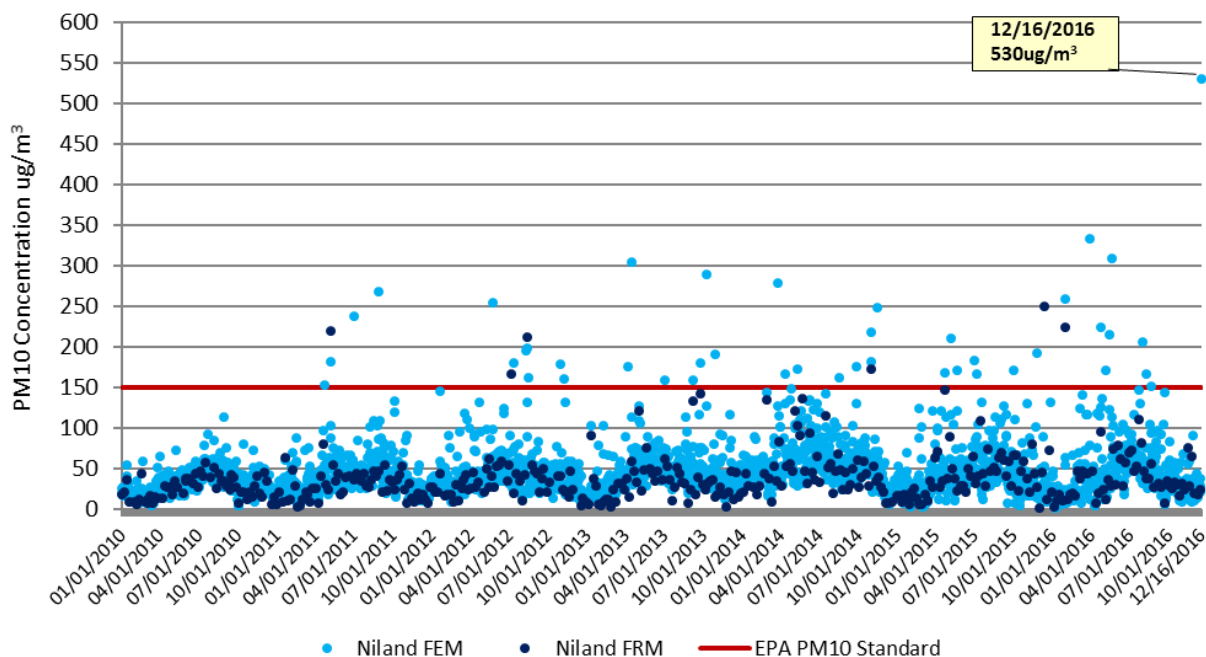


Fig 3-4: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 530 $\mu\text{g}/\text{m}^3$ by the Niland monitor was outside the normal historical concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold

FIGURE 3-5
WESTMORLAND HISTORICAL
FRM AND FEM PM₁₀ 24-HR AVG. CONCENTRATIONS
JANUARY 1, 2010 TO DECEMBER 16, 2016

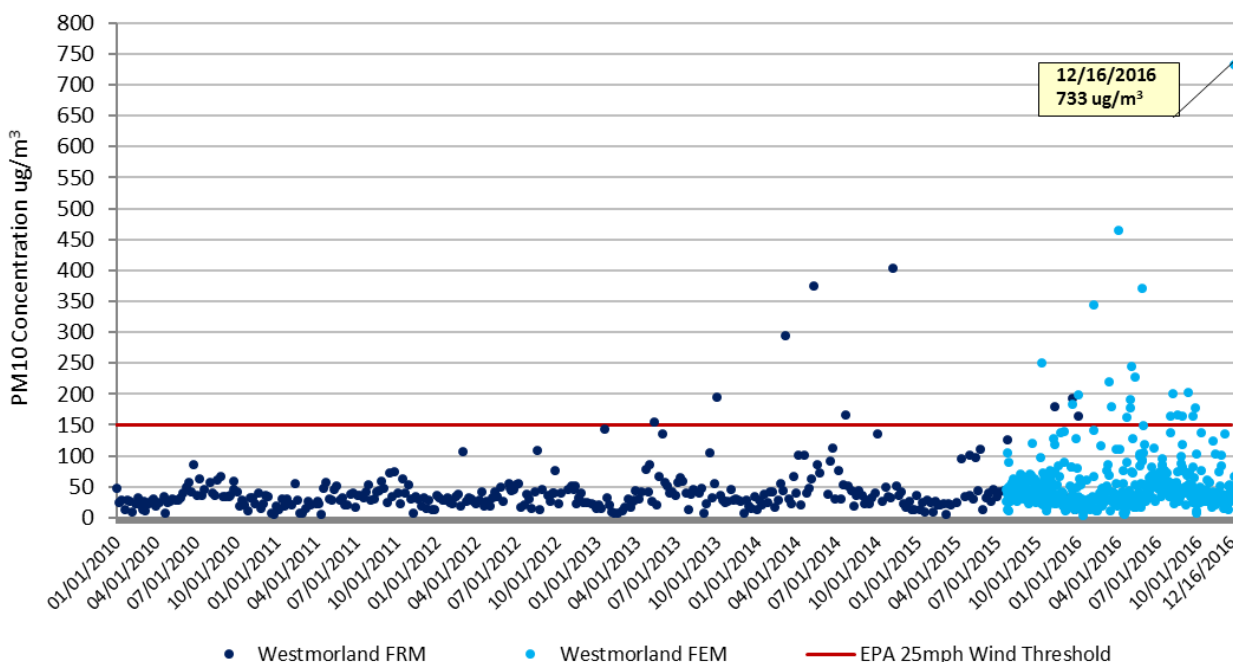


Fig 3-5: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 733 $\mu\text{g}/\text{m}^3$ by the Westmorland monitor was outside the normal historical concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold

The time series, **Figures 3-1**, for Brawley, Calexico, El Centro, Niland, and Westmorland included 2,542 sampling days (January 1, 2010 through December 16, 2016). During this period the Brawley station (**Figure 3-1**) measured 2,946 credible samples measured by either FRM or FEM monitors between January 1, 2010 and December 16, 2016. Overall, the time series illustrates that of the 2,946 credible samples measured during there was a total of 59 exceedance days, which is a 2.0% occurrence rate. Calexico (**Figure 3-2**) measured 698 credible samples measured by either FRM or FEM monitors during this period (FEM sampling commenced in July 2015) during which the station measured 11 exceedance days. This translates into 1.6% of all samples. El Centro (**Figure 3-3**) measured 875 credible samples measured by either FRM or FEM monitors during this period (FEM sampling commenced in July 2015) during which the station measured nine exceedance days. This translates into 1.0% of all samples. Niland (**Figure 3-4**) measured 2,943 credible samples measured by either FRM or FEM monitors during this period (FEM sampling began in July 2015) and measured 46 exceedance days. This equates to 1.6% of all samples. Westmorland (**Figure 3-3**) measured 878 credible samples measured by either FRM or FEM monitors during this period (FEM sampling began in July 2015) and measured 28 exceedance days. This equates to 3.2% of all samples.

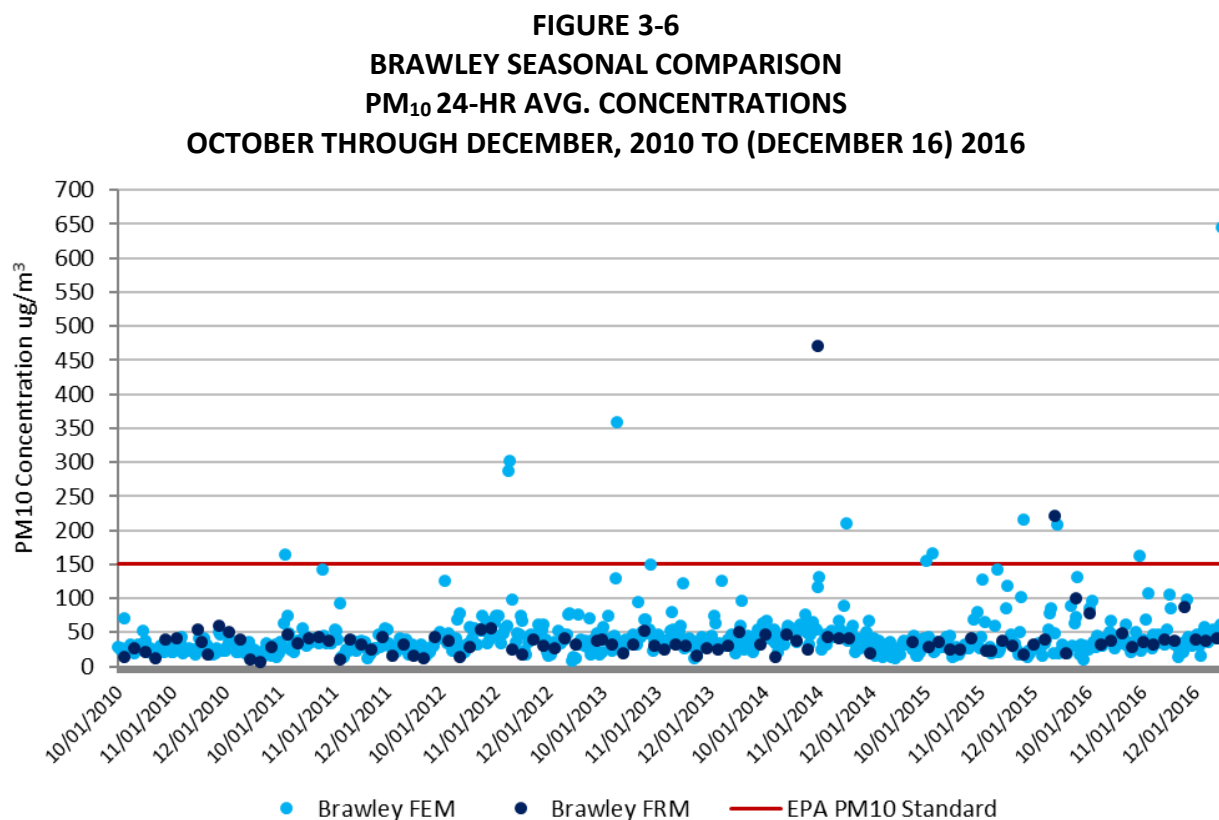


Fig 3-6: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 162 $\mu\text{g}/\text{m}^3$ on December 16, 2016 at the Brawley monitoring station was outside the normal seasonal historical measurements. The far vast number of samples fall way below the exceedance threshold

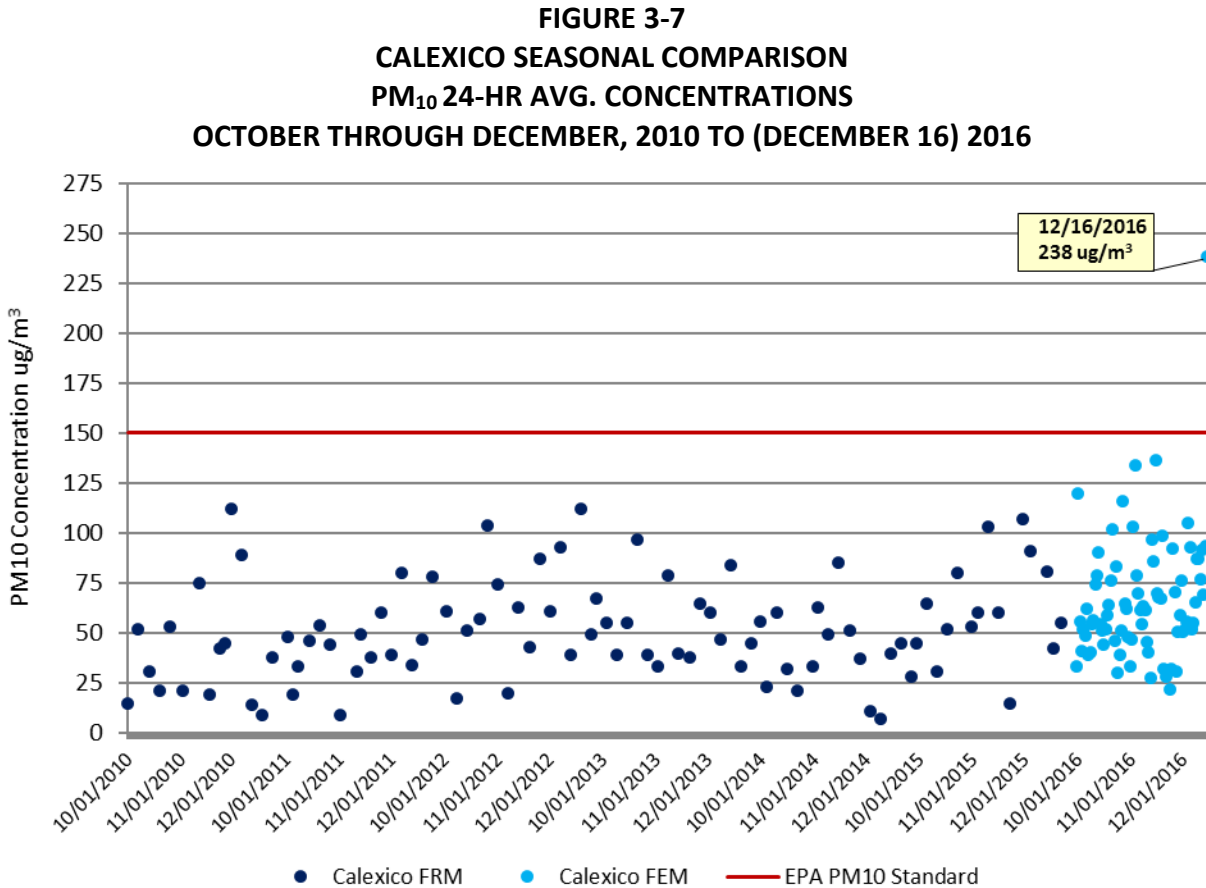


Fig 3-7: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 238 $\mu\text{g}/\text{m}^3$ on December 16, 2016 at the Callexico monitoring station was outside the normal seasonal historical measurements. The far vast number of samples fall way below the exceedance threshold

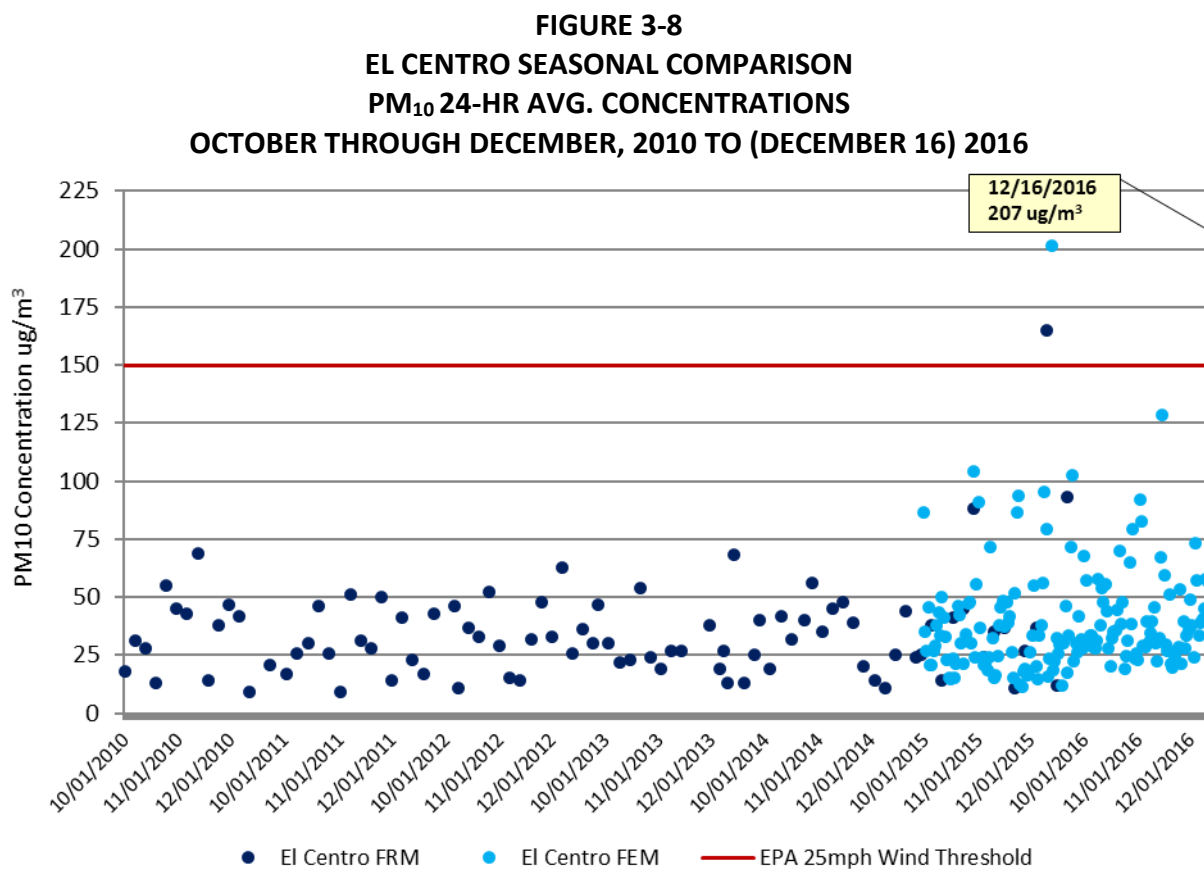


Fig 3-8: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 207 $\mu\text{g}/\text{m}^3$ on December 16, 2016 at the El Centro monitoring station was outside the normal seasonal historical measurements. The far vast number of samples fall way below the exceedance threshold

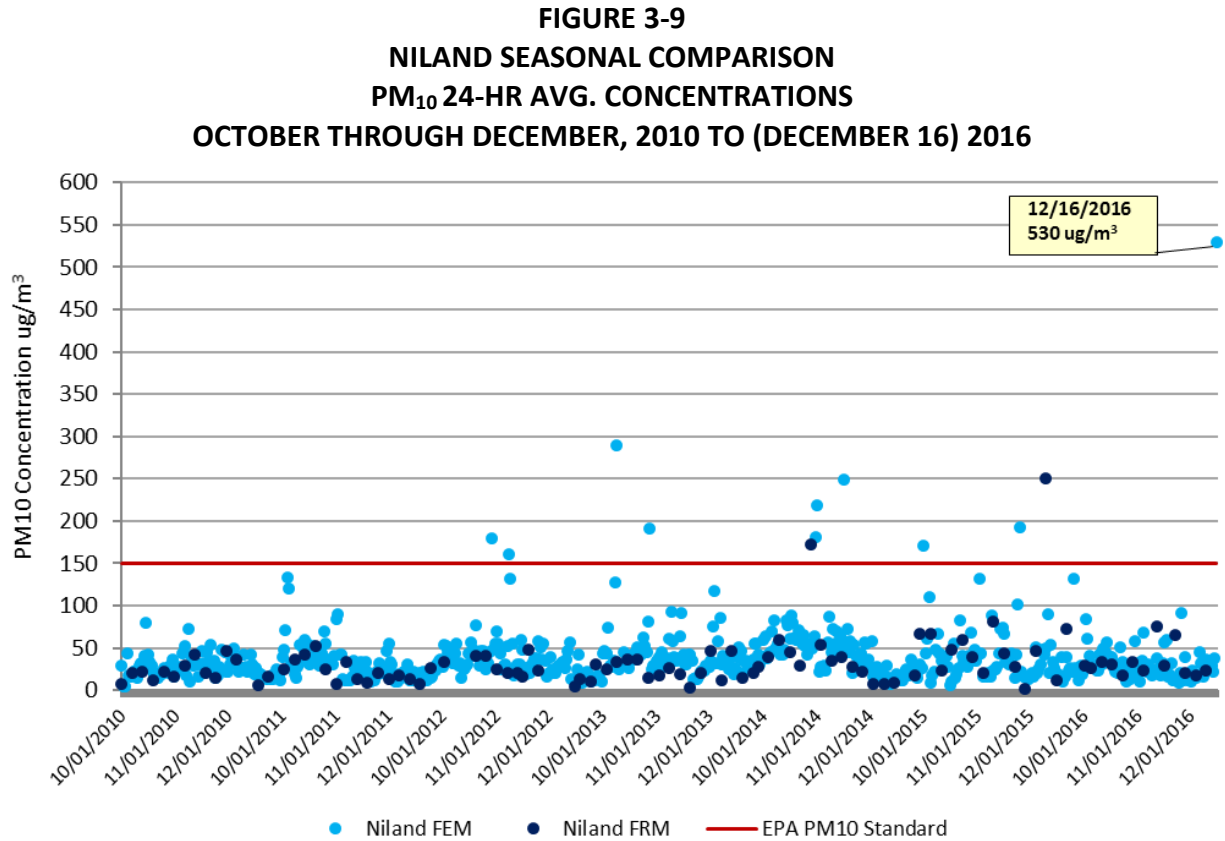


Fig 3-9: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 530 $\mu\text{g}/\text{m}^3$ on December 16, 2016 at the Niland monitoring station was outside the normal seasonal historical measurements. The far vast number of samples fall way below the exceedance threshold

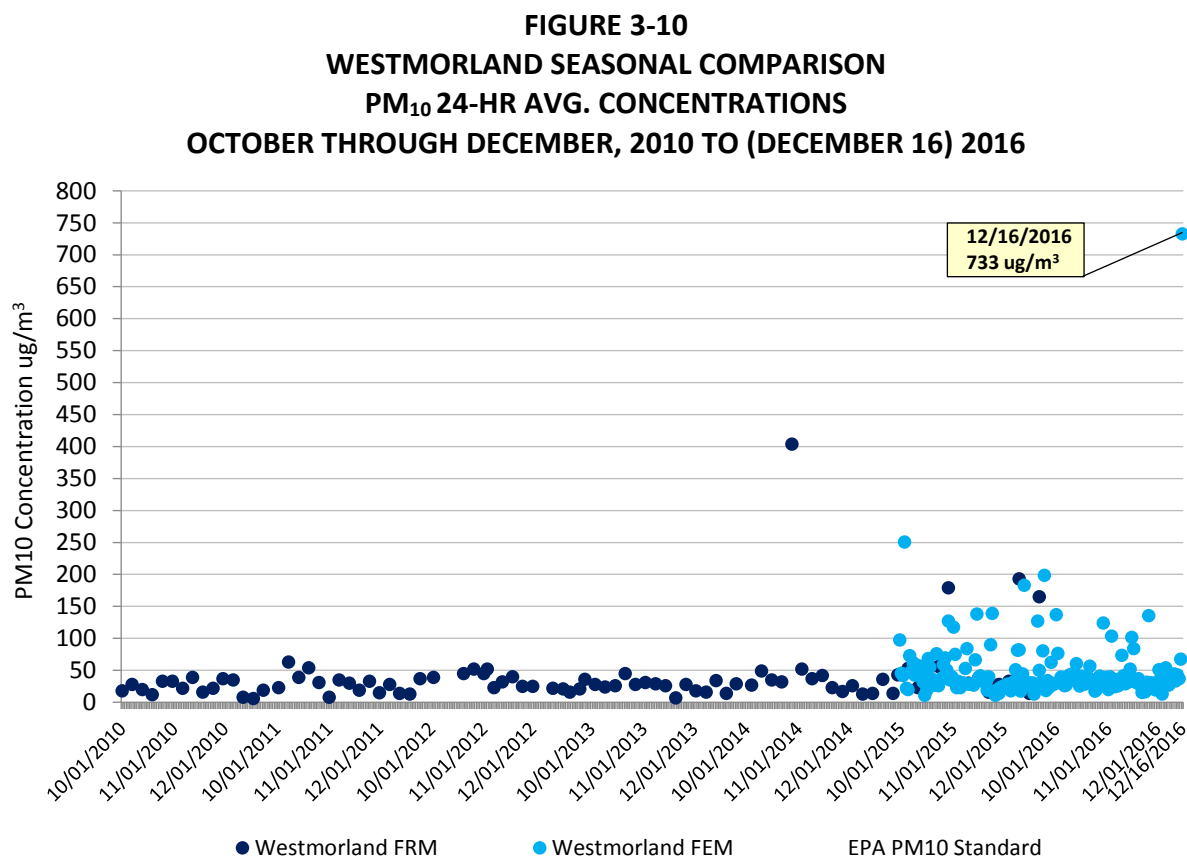


Fig 3-10: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 733 $\mu\text{g}/\text{m}^3$ on December 16, 2016 at the Westmorland monitoring station was outside the normal seasonal historical measurements. The far vast number of samples fall way below the exceedance threshold

Figures 3-6 through 3-10 display the seasonal fluctuations over 629 sampling days at the Brawley, Calexico, El Centro, Niland, and Westmorland stations for months October through December of years 2010 through 2016 (2016 ending December 16). The seasonal sampling period for Brawley (**Figure 3-6**) contains 726 combined FRM and FEM samples. Of these, 11 exceedances occurred during the fourth quarter which translates into 1.5% of all samples. The seasonal sampling period for Calexico (**Figure 3-7**)⁸ contains 170 credible samples and only one exceedance day. This translates into 0.6% of all samples. The seasonal sampling period for El Centro (**Figure 3-8**)⁹ contains 259 credible samples and two exceedance days, or 0.8% of all samples.

The seasonal sampling period for the Niland monitor (**Figure 3-9**) contains 729 credible samples and 11 exceedance days, or 1.5% of all samples. The seasonal sampling period for Westmorland station (**Figure 3-10**)¹⁰ contains 259 credible samples and six exceedance days, or 2.3% of all

⁸ FEM sampling at the Calexico site began January 2016; therefore, 2016 is the only seasonal FEM data available.

⁹ FEM sampling at the El Centro site began July 2015; therefore 2016-2015 is the only seasonal FEM data available.

¹⁰ FEM sampling at the Westmorland site began July 2015; therefore 2016-2015 is the only seasonal FEM data available.

samples.

Figures 3-11 through 3-15 display percentile rankings for Brawley, Calexico, El Centro, Niland, and Westmorland over the historical period of January 2010 through December 16, 2016.

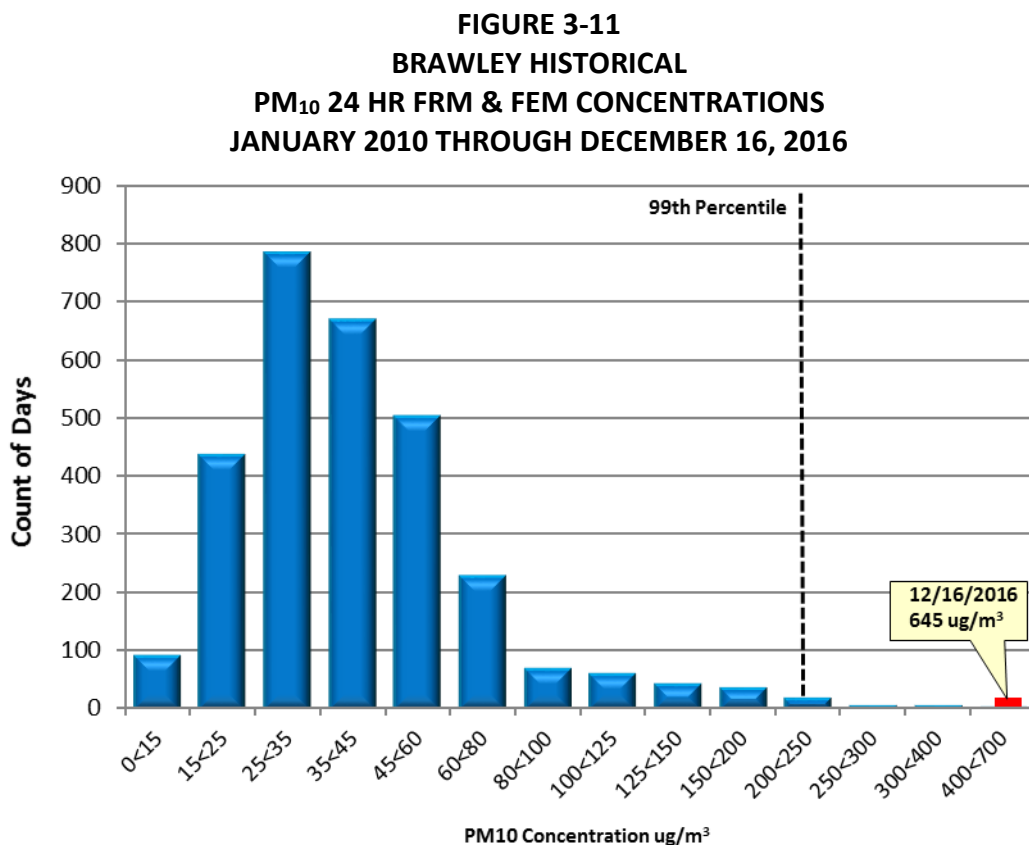


Fig 3-11: The 24-hr average PM₁₀ concentration at the Brawley monitoring station demonstrates that the concentration of 645 $\mu\text{g}/\text{m}^3$ on December 16, 2016 was in excess of the 99th percentile by a wide margin

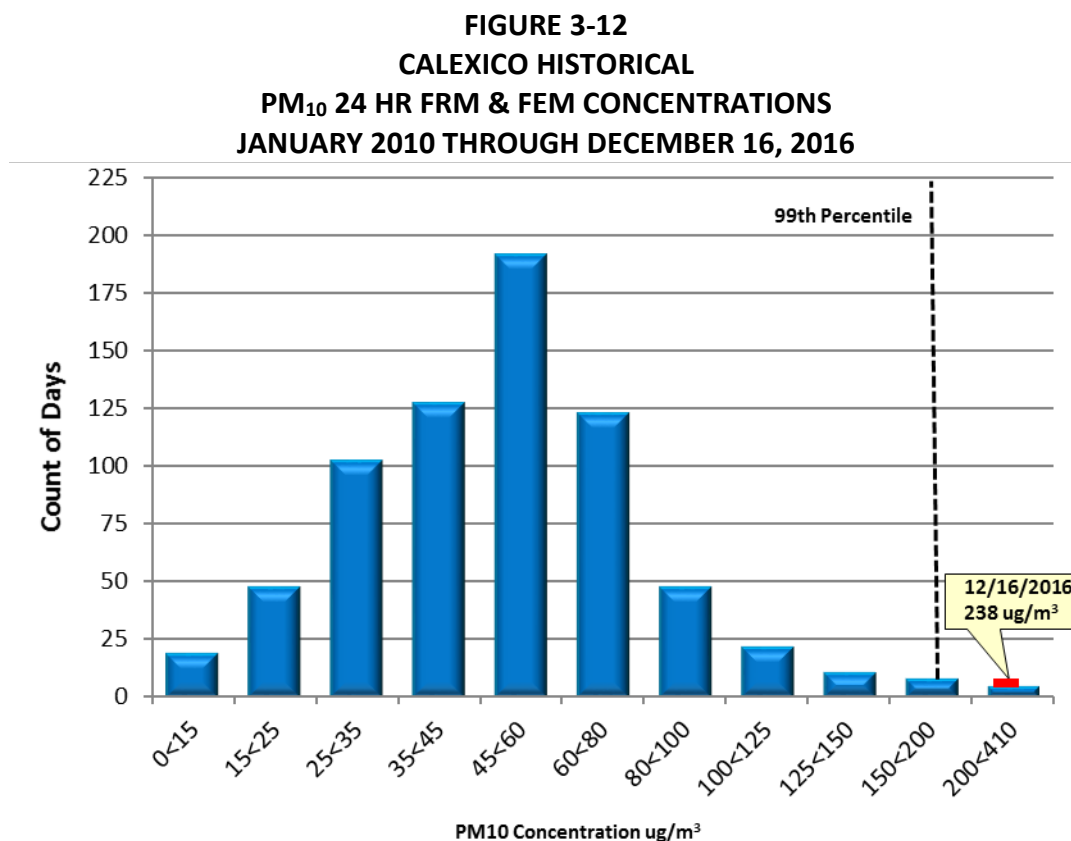


Fig 3-12: The 24-hr average PM₁₀ concentration at the Brawley monitoring station demonstrates that the concentration of 237 $\mu\text{g}/\text{m}^3$ on December 16, 2016 was in excess of the 99th percentile

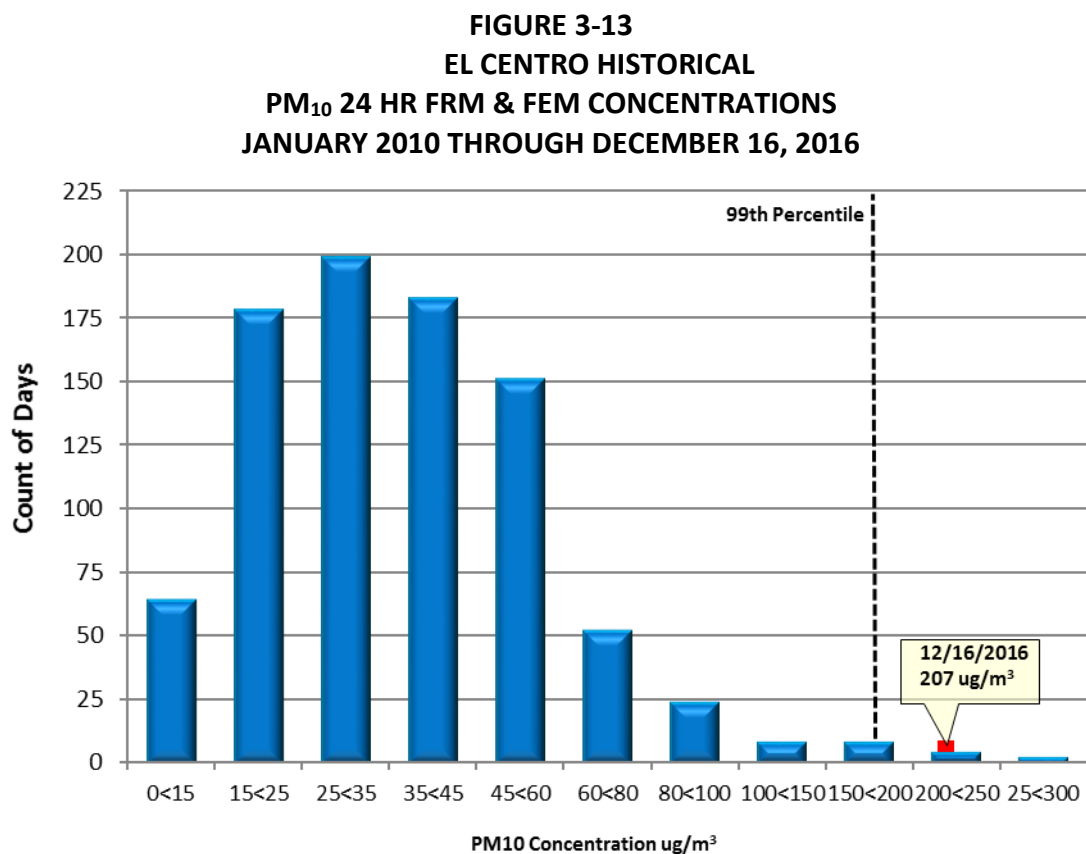


Fig 3-13: The 24-hr average PM₁₀ concentration at the Brawley monitoring station demonstrates that the concentration of 207 $\mu\text{g}/\text{m}^3$ on December 16, 2016 was in excess of the 99th percentile

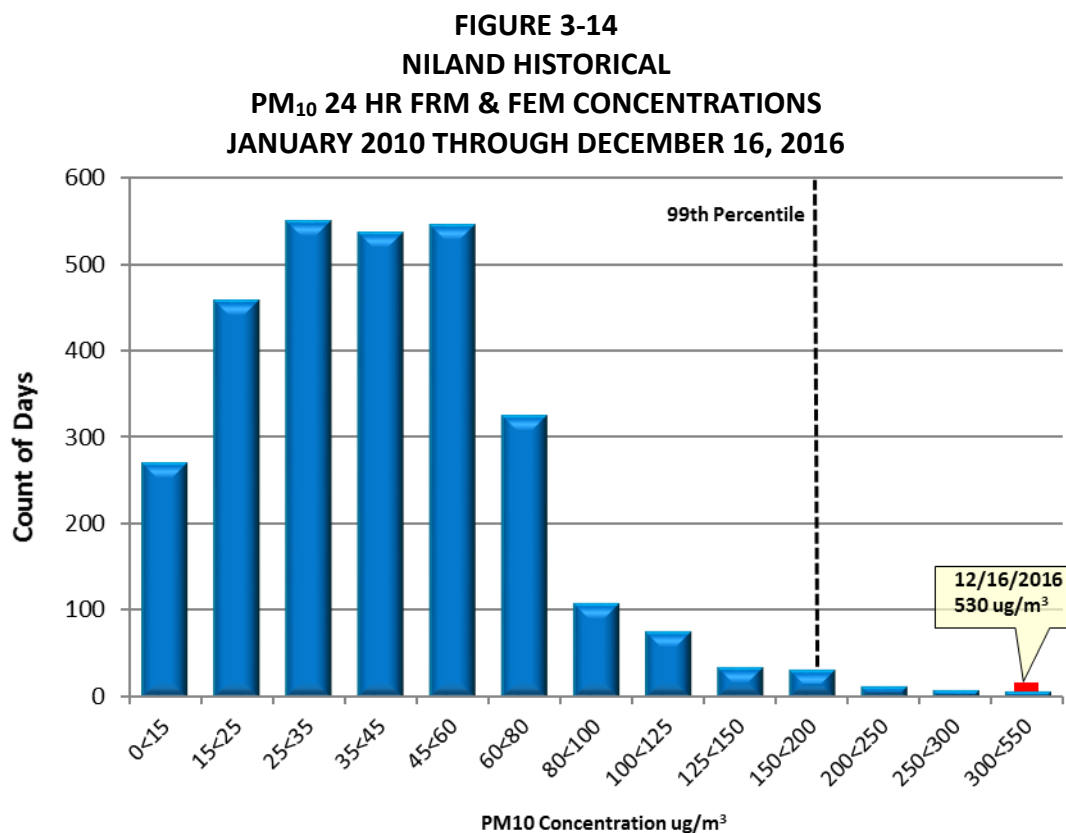


Fig 3-14: The 24-hr average PM₁₀ concentration at the Brawley monitoring station demonstrates that the concentration of 530 µg/m³ on December 16, 2016 was in excess of the 99th percentile by a wide margin

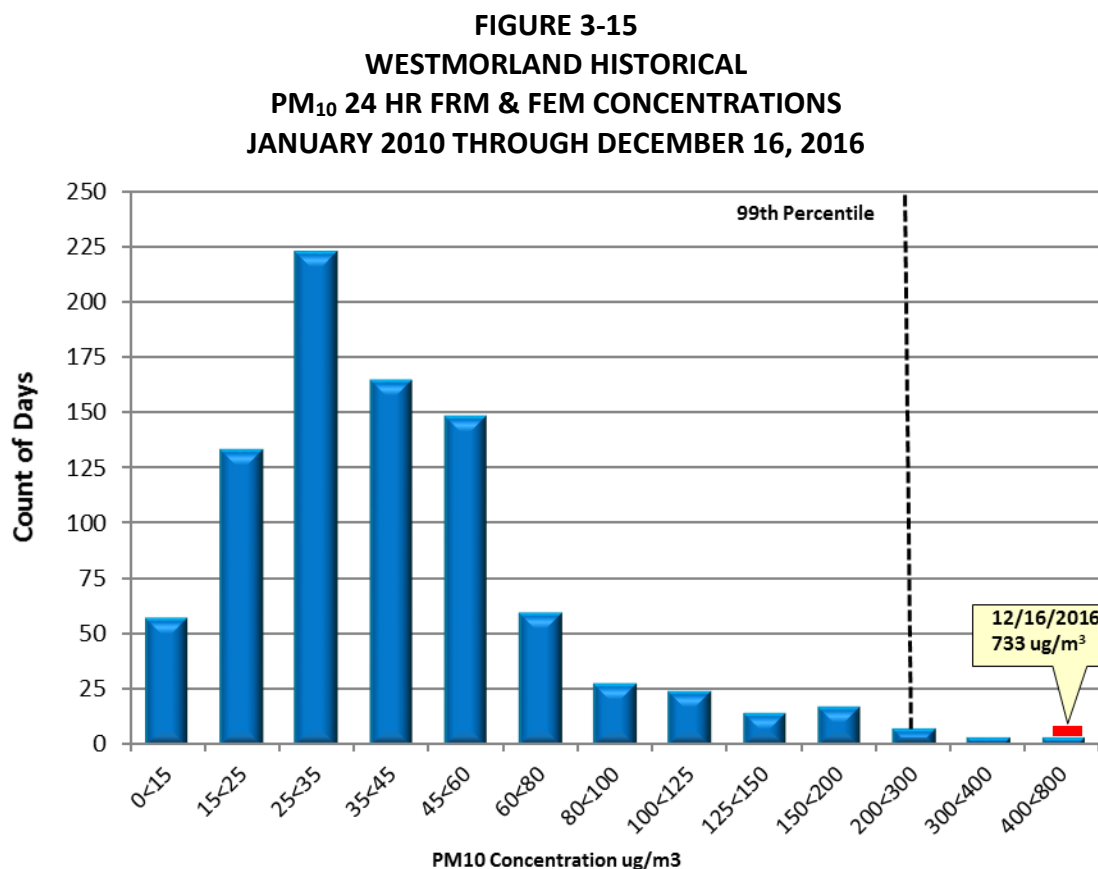


Fig 3-15: The 24-hr average PM₁₀ concentration at the Brawley monitoring station demonstrates that the concentration of 733 $\mu\text{g}/\text{m}^3$ on December 16, 2016 was in excess of the 99th percentile by a wide margin

For the combined FRM and FEM data sets, the annual historical PM₁₀ concentrations of 645 $\mu\text{g}/\text{m}^3$, 238 $\mu\text{g}/\text{m}^3$, 207 $\mu\text{g}/\text{m}^3$, 530 $\mu\text{g}/\text{m}^3$, and 733 $\mu\text{g}/\text{m}^3$ at Brawley, Calexico, El Centro, Niland, and Westmorland, respectively, are all above the 99th percentile ranking. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings for the historical patterns, the December 16, 2016 measured exceedances are clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM₁₀ concentration observed on December 16, 2016 occurs infrequently. When comparing the measured PM₁₀ levels on December 16, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors were outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the December 16, 2016 natural event affected the concentrations levels at the Brawley, Calexico, El

Centro, Niland, and Westmorland monitors causing exceedances of the NAAQS. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on December 16, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the “not reasonably controllable or preventable” (nRCP) criterion as two prongs. In order to properly address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures in order to properly consider the measures as enforceable. USEPA considers control measures to be enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered not reasonably controllable if reasonable measures to control the affect of the event on air quality were applied at the time of the event. Similarly, an event is considered not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for “high wind events” when PM₁₀ concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a “natural event” where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for December 16, 2016. In addition, this December 16, 2016, demonstration provides technical and non-technical evidence that strong and gusty westerly winds blew across portions of the Sonoran Desert to the west of and into Imperial County suspending particulate matter affecting the Brawley monitor on December 16, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the December 16, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM₁₀) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM₁₀ NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM₁₀ from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM₁₀. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

**FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT**

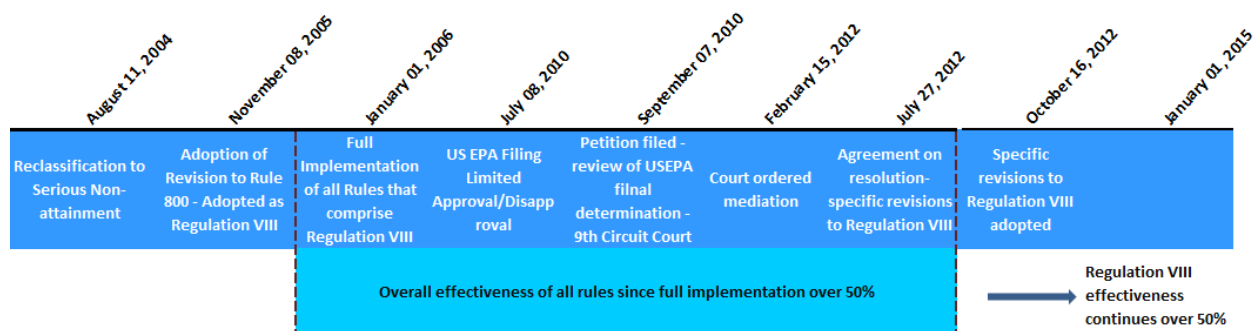


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII which is comprised of seven fugitive dust rules is found below. The complete set of rules can be found in **Appendix D**.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM₁₀ from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM₁₀ events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On December 16, 2016 the ICAPCD declared a No Burn day (**Appendix A**). No complaints were filed for agricultural burning on December 16, 2016.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around during the December 16, 2016 PM₁₀ exceedances. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted

sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM₁₀ emissions. December 16, 2016 was officially designated as a No Burn day. No complaints were filed on December 16, 2016 related either to agricultural or waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

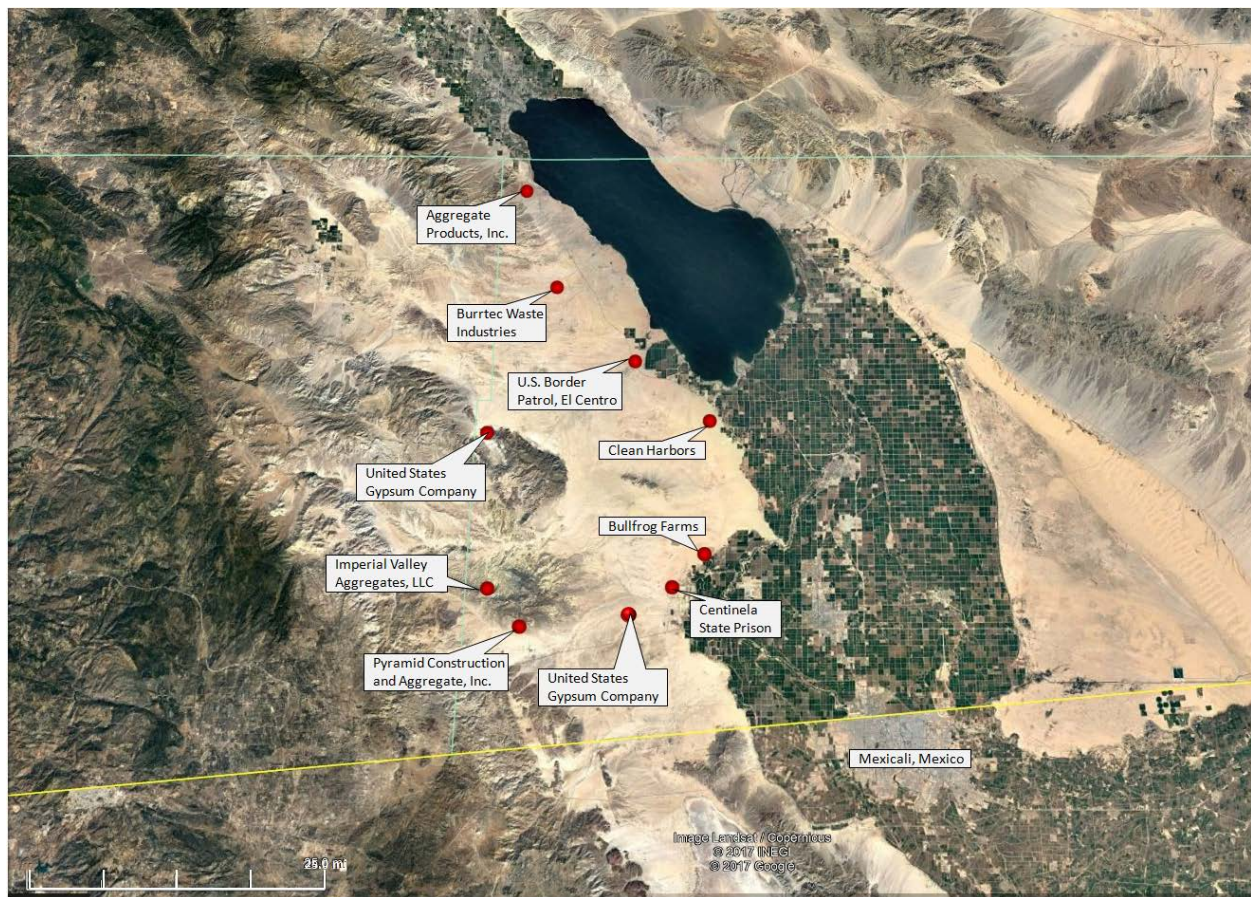


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Brawley, Calexico, El Centro, Niland and Westmorland monitors. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition the desert areas are managed either by the Bureau of Land Management or the California Department of Parks. Base map from Google Earth.

FIGURE 4-3
NON-PERMITTED SOURCES

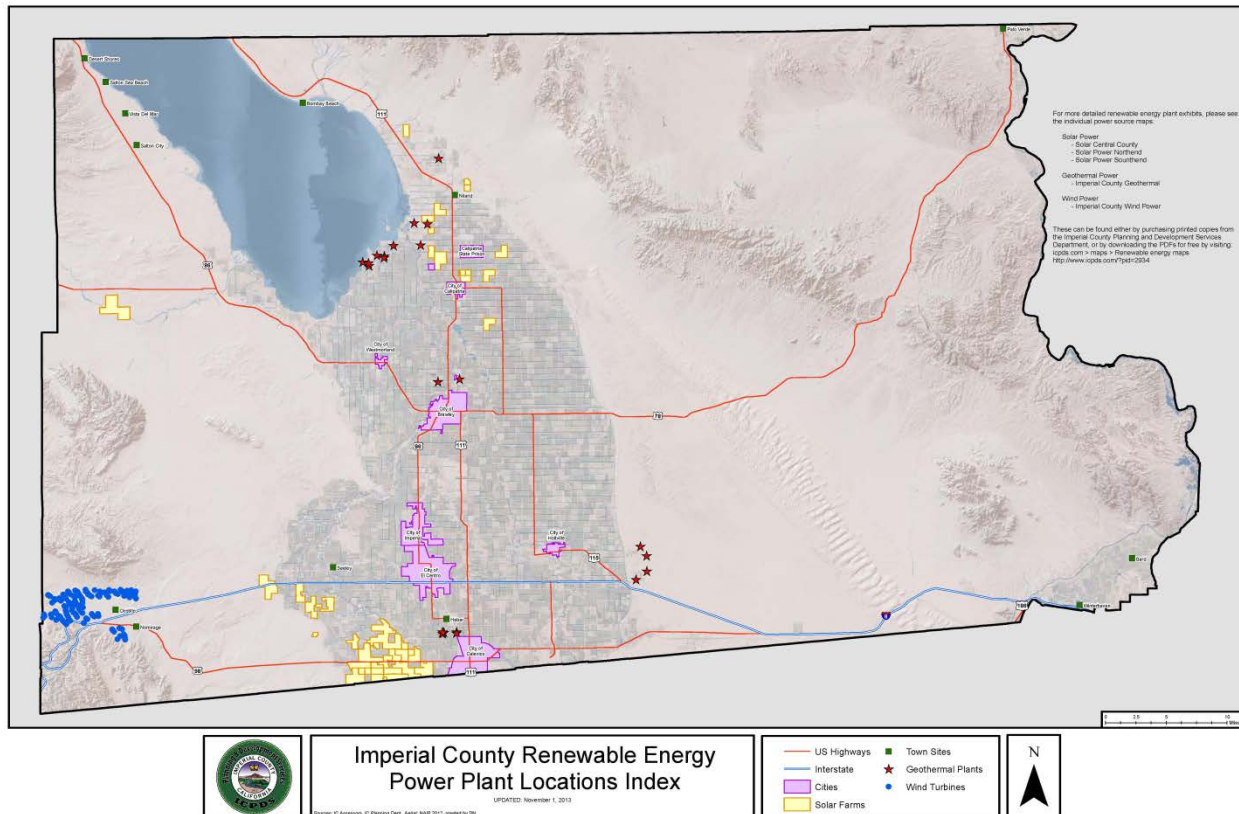


Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley, Calexico, El Centro, Niland and Westmorland monitors. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants.

IV.2 Forecasts and Warnings

The ICAPCD and the National Weather Service (NWS) provided an extended week-to-weekend notification via the ICAPCD's webpage on Tuesday, December 13, 2016 explaining that a deep trough of low pressure would move through the region during Thursday, December 15, 2016 and Friday, December 16, 2016, creating a strong onshore flow and gusty west-to-southwesterly winds across southeast California. Weather Stories issued by the NWS and Phoenix offices that forecasted a large storm moving through southern California were posted on the ICAPCD website beginning December 13, 2016 and continued through Friday, December 16, 2016. That day the ICAPCD posted on its website a Weather Briefing issued by the NWS Phoenix office notifying the public that strong gusty winds of 20-35 mph with gusts over 40 mph would affect southeast California and southwest Arizona. Blowing dust was expected.

On December 15, 2016 a Wind Advisory was issued for Imperial County in anticipation of the approaching storm. Westerly winds of 25 to 40 mph were expected with gusts reaching 50 mph. Hazardous driving conditions due to cross winds and dense blowing dust and sand was expected.

The advisory was in effect from 4 a.m. to 8 p.m. on Friday, December 16, 2016. The expected magnitude of the storm prompted the NWS San Diego office to issue a High Wind Watch for a large area including the San Diego deserts effective December 15, 2016 through December 16, 2016. Damaging winds were expected along the mountain ridge tops to the desert floor. Winds were forecasted to reach 40 mph with gusts of 75 mph in the mountains and 60 mph on the desert floor. Blowing sand and dust was expected to reduce visibility. These desert areas were immediately upstream of Imperial County on December 16, 2016.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County (**Table 2-2**). Data were also collected from automated meteorological instruments that were upstream from the Brawley monitoring station during the wind event. On December 16 the El Centro NAF (KNJK) and Imperial County Airport (KIPL) measured winds at or above 25 mph for multiple hours. Peak winds were 34 mph while gusts reached 45 mph. Automated instruments at the upstream locations of Mountain Springs Grade, Ocotillo Wells, and Borrego Springs all reported winds at or above 25 mph. Top upstream winds were 37 mph and peak gusts reach 61 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM₁₀ control measures. During the December 16, 2016 event wind speeds were at or above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds associated with the movement of a low-pressure system through the region entrained dust that caused uncontrollable PM₁₀ emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM₁₀, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of the Brawley monitoring station during the event were high enough (at or above 25 mph, with wind gusts of 61 mph) that BACM PM₁₀ control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on December 16, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The December 16, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for Friday, December 16, 2016 identified a strong Pacific low-pressure system and accompanying cold front that moved through southern California. As surface gradients tightened powerful winds swept across southeast California and Imperial County. Winds reaching 34 mph and gusts of 45 mph transported windblown dust into Imperial County. Entrained windblown dust from natural areas, particularly from the desert areas west of the Brawley air quality monitoring station, along with anthropogenic sources controlled with BACM, is confirmed by the meteorological and air quality observations on December 16, 2016.

Figures 5-1 and Figure 5-2 are Aqua MODIS images that captured dust transported across southeast California.

**FIGURE 5-1
DUST PLUME CAPTURED BY TERRA SATELLITE**

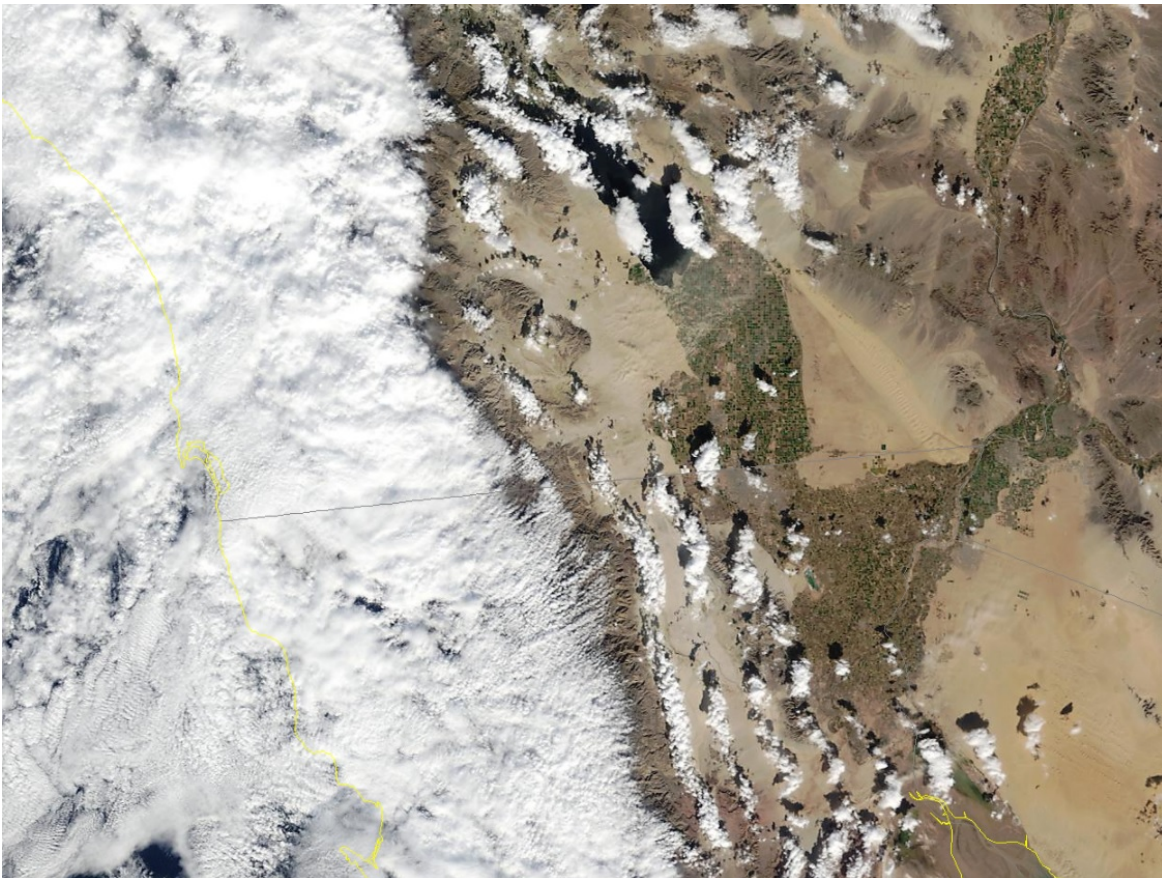


Fig 5-1: The MODIS instrument onboard the Terra satellite captured dust plumes streaming across Imperial County at approximately 1030 PST on December 16, 2016. A smaller plume can be seen originating in Mexico (bottom right). Source: MODIS Today

FIGURE 5-2
DUST PLUME CAPTURED BY AQUA SATELLITE

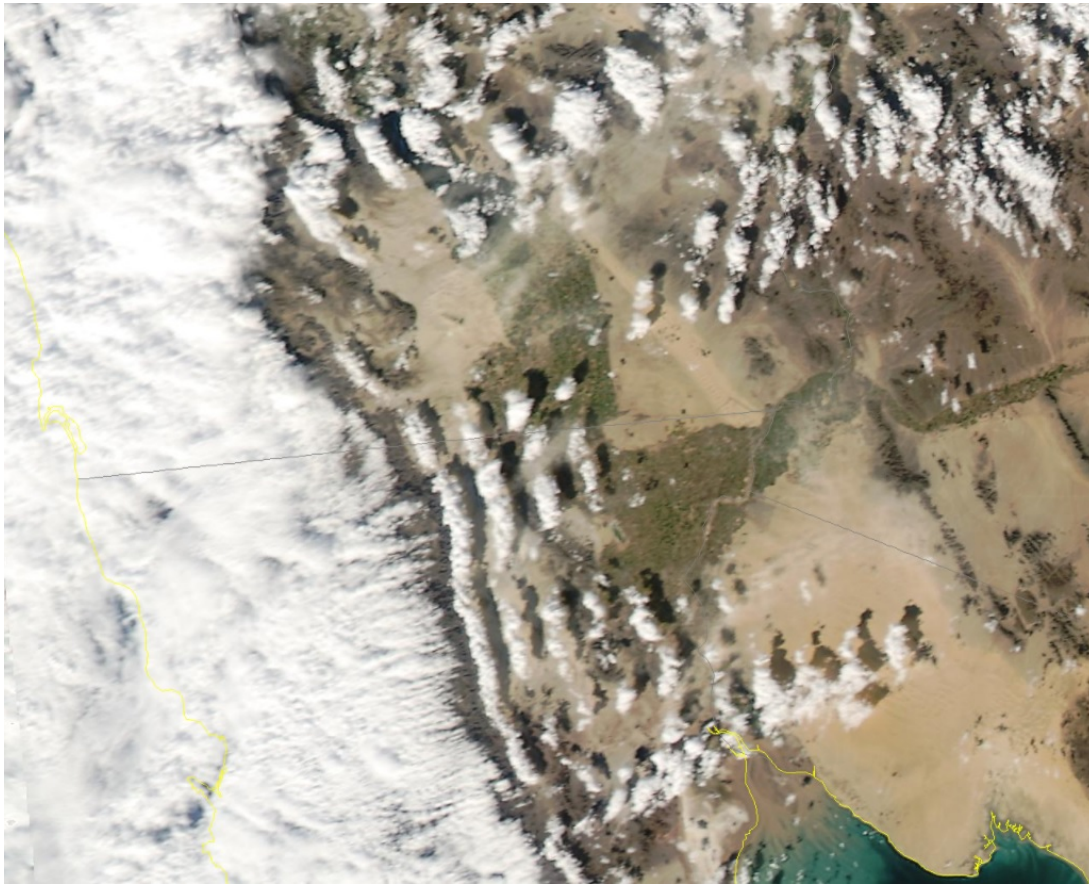


Fig. 5-2: The MODIS instrument onboard the Aqua satellite captured a large dust plume over Imperial County at ~1330 PST on December 16, 2016. A second large plume can be seen in northern Mexico just south of the international boarder. Source: MODIS Today

The satellite images are supported by the NOAA Smoke Text Product (**Appendix A**) which described blowing dust over southeast California along with some dust originating from northwestern Baja, Mexico.

Figures 5-3 through 5-6 show the aerosol optical depth¹¹ over southeast California using the

¹¹ Aerosol Optical Depth (AOD) (or Aerosol Optical Thickness) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is “clean” - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Aerosols also have an effect on the weather and climate by cooling or warming the earth, helping or preventing clouds from forming. Since aerosols are difficult to identify

Deep Blue and Deep Blue Angstrom exponent¹² using the MODIS instrument onboard the Terra and Aqua satellites. The Terra satellite made its pass around 10:30 PST shortly after concentrations began to rise at Brawley, Niland, and Westmorland. The Aqua satellite made its pass around 13:30 PST. This was ahead of peak concentrations at Calexico, El Centro, and Niland (Brawley and Westmorland had repeatedly high values periodically through the day. The thickest AOD matches the locations of the dust plumes. These images help support that particulate matter was suspended over the area during the wind event.

when they occur over different types of land surfaces and ocean surfaces, Worldview provides several different types of imagery layers to assist in the identification.

¹² The MODIS Deep Blue Aerosol Ångström Exponent layer can be used to provide additional information related to the aerosol particle size over land. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke).

FIGURE 5-3
AOD CAPTURED BY TERRA SATELLITE

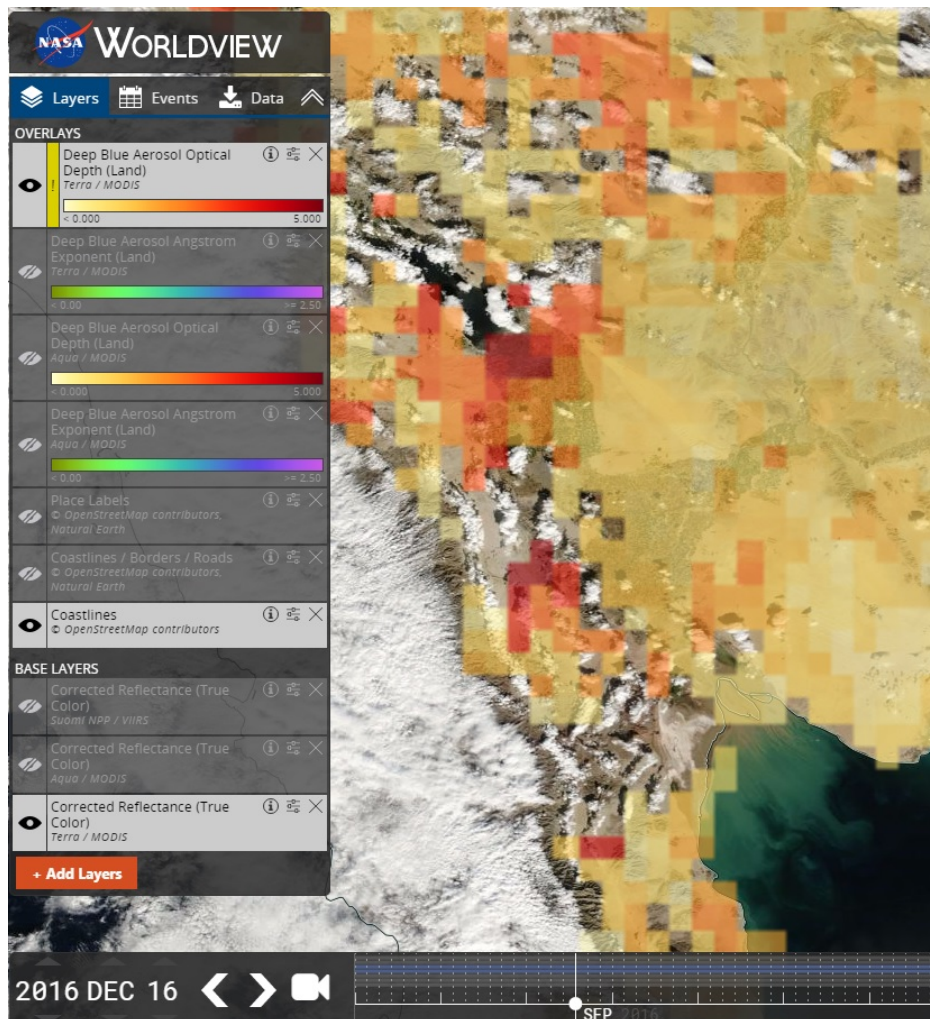


Fig 5-3: The MODIS instrument onboard the Terra satellite captured thick AOD over Imperial County at ~1030 PST on December 16, 2016. The thickest AOD matches the locations of the dust plumes. Source: <https://worldview.earthdata.nasa.gov>

FIGURE 5-4
DEEP BLUE AEROSOL ANGSTROM EXPONENT – TERRA SATELLITE

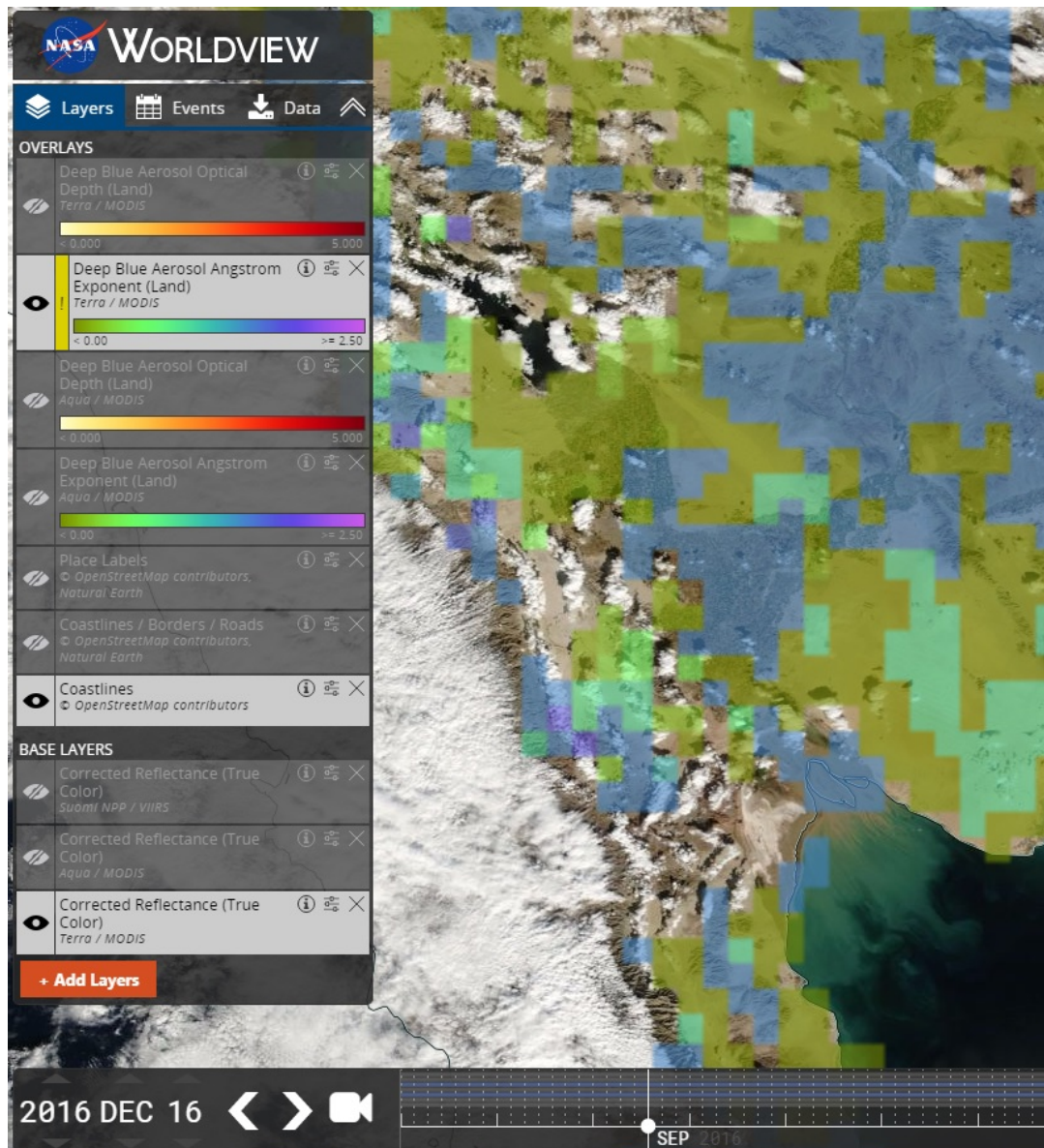


Fig 5-3: The MODIS instrument onboard the Terra satellite captured thick AOD over Imperial County at ~1030 PST on December 16, 2016. The image utilizes the Deep Blue Angstrom Exponent. The greenish color indicates heavier particles which means the increased likelihood of dust. Source: <https://worldview.earthdata.nasa.gov>

FIGURE 5-5
AOD CAPUTRED BY AQUA SATELLITE

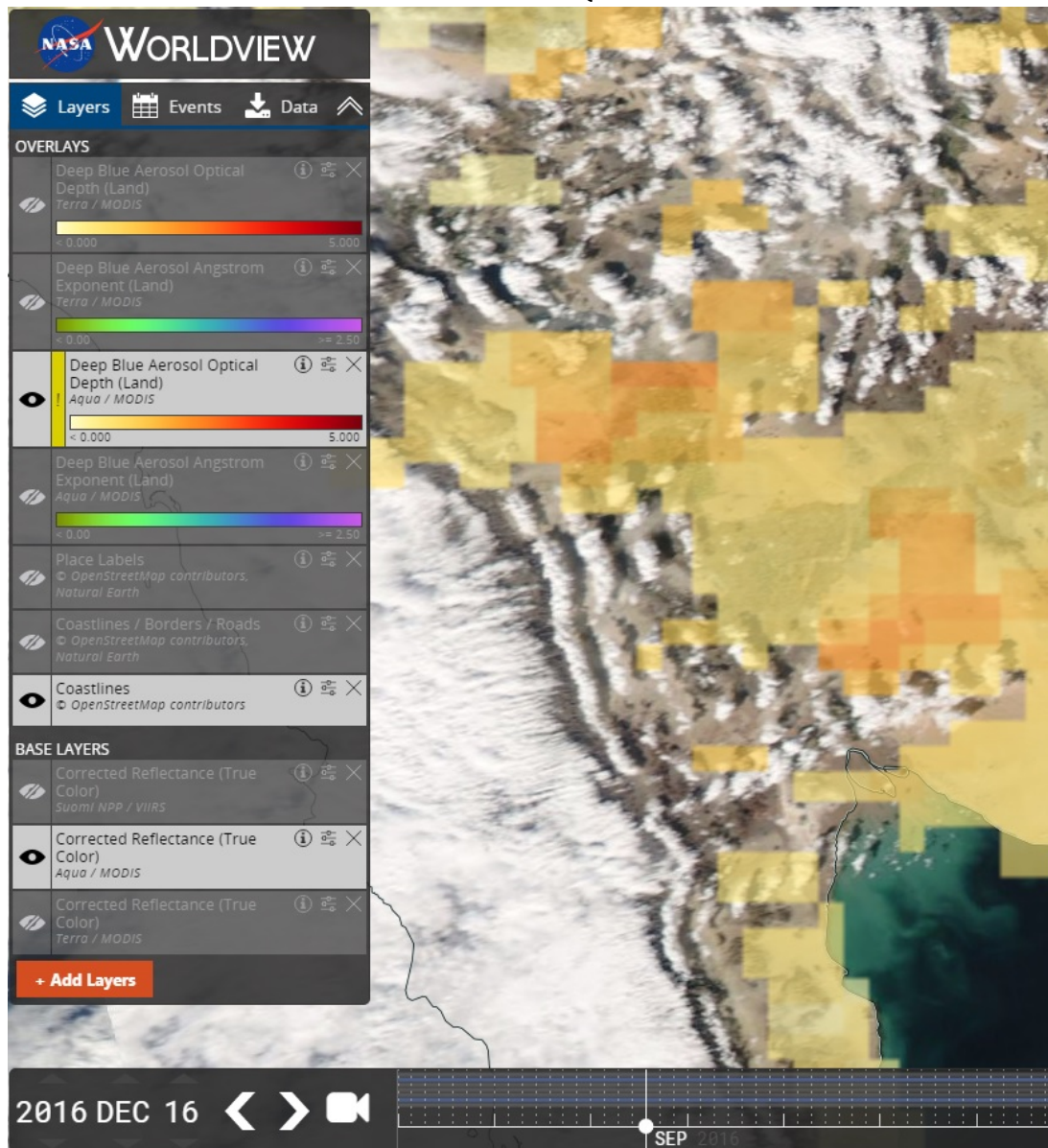


Fig 5-5: The MODIS instrument onboard the Aqua satellite captured moderately thick AOD over Imperial County at ~1330 PST on December 16, 2016. The thickest AOD matches the locations of the dust plumes. The satellite made its pass before peak concentrations were reached at three stations. Source: <https://worldview.earthdata.nasa.gov>

FIGURE 5-6
DEEP BLUE AEROSOL ANGSTROM EXPONENT – AQUA SATELLITE

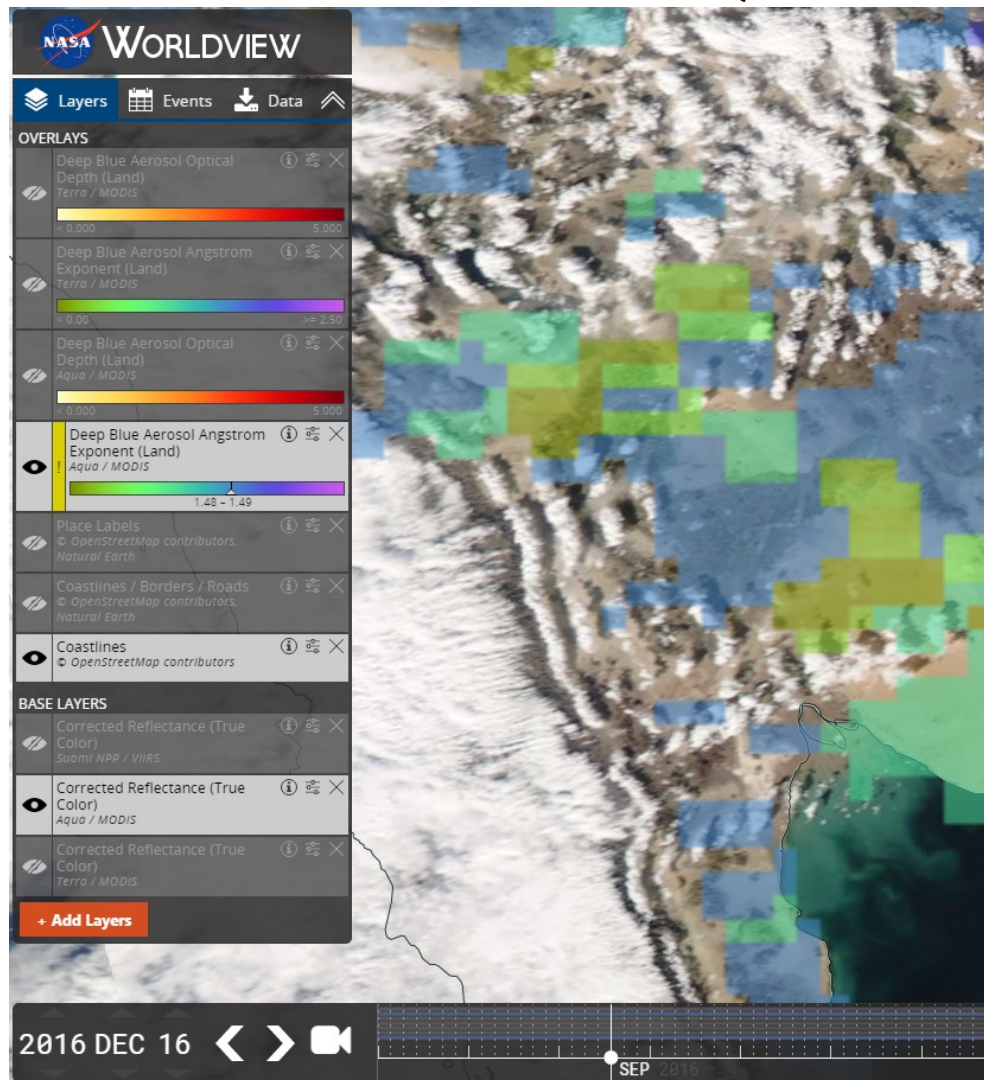


Fig 5-6: The MODIS instrument onboard the Aqua satellite captured moderately thick AOD over Imperial County at ~1330 PST on December 16, 2016. The image utilizes the Deep Blue Angstrom Exponent. The greenish color indicates heavier particles which means the increased likelihood of dust. Source: <https://worldview.earthdata.nasa.gov>

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.¹³ **Table 5-1** provides a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM₁₀ concentrations at the exceeding stations on December 16, 2016. The tables show that peak hourly concentrations took place immediately following or during the period of high upstream wind speeds.

¹³ "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

TABLE 5-1
UPSTREAM WIND SPEEDS AND BRAWLEY PM₁₀ CONCENTRATIONS

Mountain Springs Grade (TNSC1)				Imperial Co. Airport (KIPL)				El Centro NAF (KNJK)					Ocotillo Wells (AS938/KD6RSQ5)				Brawley FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	Obs.	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
2150	23	214	44	2153	23	260	30	2156	24	260	38	BLDU	2100	7	300	11	2100	105
2250	24	220	42	2253	20	280		2256	18	270	32	BLDU	2200	15	320	25	2200	89
2350	22	211	43	2353	11	290		2356	18	290			2300	16	323	29	2300	314
050	28	227	54	53	18	290	29	56	20	320	32		029	18	329	29	0000	168
150	28	222	52	153	14	260		156	24	250			130	19	334	35	0100	431
250	32	204	50	253	16	280	25	256	20	250			214	14	316	23	0200	995
350	26	202	50	353	10	240		356	11	320			315	13	313	19	0300	995
450	17	216	37	453	8	260		456	13	270			405	5	326	12	0400	143
550	17	226	37	553	5	170		556	5	280			505	3	319	8	0500	96
650	19	229	35	653	11	180		656	5	VR			615	18	309	32	0600	55
750	20	219	47	753	5	VR		756	8	220			725	17	316	30	0700	105
850	22	217	43	853	8	170		856	6	VR			825	14	327	22	0800	995
950	25	223	46	919	21	240	29	956	34s	250	39	BLDU	907	18	336	30	0900	653
1050	28	222	47	1053	6	220		1007	33	250	44	BLDU	1010	18	310	29	1000	995
1150	33	225	50	1153	20	260	25	1156	24	270			1110	15	317	36	1100	995
1250	32	222	53	1253	22	230	31	1256	25	270			1244	14	316	32	1200	689
1350	34	207	59	1353	18	260	29	1356	28	280			1335	13	310	28	1300	424
1450	28	215	51	1453	23	290	33	1456	16	280	25		1430	22	331	36	1400	833
1550	37	234	51	1553	32	280	40	1556	29	270	39		1520	25	319	37	1500	405
1650	33	230	52	1653	24	260	32	1656	17	310			1600	23	2	35	1600	995
1750	29	222	50	1753	30	260	40	1756	18	230			1724	23	317	43	1700	995
1850	32	223	50	1853	32	260	41	1856	10	240			1855	29	292	50	1800	
1950	32	236	61	1953	28	260	40	1954	21	250	25		1925	35	330	59	1900	
2050	31	227	56	2053	24	260	31	2056	18	230			2012	32	317	53	2000	
2150	27	225	51	2153	24	260	31	2128	24	230	33		2110	24	306	41	2100	669
2250	34	240	55	2253	25	260	34	2256	7	250			2215	24	298	38	2200	917
2350	26	232	50	2353	14	250	22	2357	32	260	45		2305	22	307	36	2300	995

*Wind data for KNJK and KIPL from the NCEI's QCLCD system. Wind data for Ocotillo Wells (AS938/KD6RSQ5) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Brawley station does not measure wind data. Wind speeds = mph; Direction = degrees. BLDU = blowing dust. Blue signifies December 15, 2016.

TABLE 5-2
UPSTREAM WIND SPEEDS AND CALEXICO PM₁₀ CONCENTRATIONS

Mountain Springs Grade (TNSC1)				Sunrise-Ocotillo (IMPSD)				El Centro NAF (KNJK)					Calexico				Calexico FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	Obs.	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
2150	23	214	44	2100	2	239	5	2156	24	260	38	BLDU	2100	1.2	78		2100	89
2250	24	220	42	2200	9	307	17	2256	18	270	32	BLDU	2200	1.2	104		2200	82
2350	22	211	43	2300	7	328	11	2356	18	290			2300	1.4	105		2300	70
050	28	227	54	000	5	241	11	56	20	320	32		0000	1.6	105		0000	57
150	28	222	52	130	16	276	35	156	24	250			0100	0.9	151		0100	41
250	32	204	50	200	11	308	19	256	20	250			0200	1.4	201		0200	35
350	26	202	50	320	17	248	25	356	11	320			0300	2.1	108		0300	25
450	17	216	37	430	16	279	27	456	13	270			0400	3.1	155		0400	36
550	17	226	37	510	16	237	25	556	5	280			0500	0.9	117		0500	56
650	19	229	35	630	8	253	18	656	5	VR			0600	3.8	108		0600	111
750	20	219	47	740	19	242	30	756	8	220			0700	2.1	153		0700	84
850	22	217	43	800	22	239	33	856	6	VR			0800	1.4	151		0800	60
950	25	223	46	940	19	249	32	956	34s	250	39	BLDU	0900	3.5	125		0900	62
1050	28	222	47	1020	19	257	38	1007	33	250	44	BLDU	1000	1.4	116		1000	56
1150	33	225	50	1100	17	267	39	1156	24	270			1100	1.4	229		1100	53
1250	32	222	53	1230	16	275	31	1256	25	270			1200	10.4	276		1200	87
1350	34	207	59	1310	13	253	31	1356	28	280			1300	6.7	261		1300	41
1450	28	215	51	1430	19	236	36	1456	16	280	25		1400	7.5	260		1400	79
1550	37	234	51	1510	16	252	33	1556	29	270	39		1500	7.8	301		1500	63
1650	33	230	52	1600	11	291	23	1656	17	310			1600	11.0	340		1600	143
1750	29	222	50	1710	13	299	25	1756	18	230			1700	16.9	310		1700	327
1850	32	223	50	1830	12	312	23	1856	10	240			1800	16.9	300		1800	830
1950	32	236	61	1920	20	301	40	1954	21	250	25		1900	13.9	316		1900	281
2050	31	227	56	2000	18	297	27	2056	18	230			2000	20.3	301		2000	985
2150	27	225	51	2150	15	277	30	2128	24	230	33		2100	23.1	278		2100	
2250	34	240	55	2250	15	300	30	2256	7	250			2200	23.3	287		2200	985
2350	26	232	50	2330	21	298	43	2357	32	260	45		2300	19.2	293		2300	985

*Wind data for KNJK from the NCEI's QCLCD system. Wind data for Sunrise-Ocotillo (IMPSD) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Calexico station does not measure wind gusts. Wind speeds = mph; Direction = degrees. BLDU = blowing dust. Blue signifies December 15, 2016.

TABLE 5-3
UPSTREAM WIND SPEEDS AND EL CENTRO PM₁₀ CONCENTRATIONS

Mountain Springs Grade (TNSC1)				Sunrise-Ocotillo (IMPSD)				El Centro NAF (KNJK)					El Centro				El Centro FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	Obs.	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
2150	23	214	44	2100	2	239	5	2156	24	260	38	BLDU	2100	5.9	260		2100	44
2250	24	220	42	2200	9	307	17	2256	18	270	32	BLDU	2200	11	273		2200	76
2350	22	211	43	2300	7	328	11	2356	18	290			2300	9.5	261		2300	115
050	28	227	54	000	5	241	11	56	20	320	32		0000	1	195		0000	50
150	28	222	52	130	16	276	35	156	24	250			0100	1.7	234		0100	59
250	32	204	50	200	11	308	19	256	20	250			0200	3.8	233		0200	52
350	26	202	50	320	17	248	25	356	11	320			0300	0.6	349		0300	86
450	17	216	37	430	16	279	27	456	13	270			0400	2.7	241		0400	62
550	17	226	37	510	16	237	25	556	5	280			0500	2.8	69		0500	64
650	19	229	35	630	8	253	18	656	5	VR			0600	3.4	150		0600	77
750	20	219	47	740	19	242	30	756	8	220			0700	2.4	146		0700	153
850	22	217	43	800	22	239	33	856	6	VR			0800	3.3	113		0800	156
950	25	223	46	940	19	249	32	956	34s	250	39	BLDU	0900	4.9	243		0900	62
1050	28	222	47	1020	19	257	38	1007	33	250	44	BLDU	1000	6	262		1000	42
1150	33	225	50	1100	17	267	39	1156	24	270			1100	14.3	237		1100	207
1250	32	222	53	1230	16	275	31	1256	25	270			1200	13.6	232		1200	251
1350	34	207	59	1310	13	253	31	1356	28	280			1300	11.2	243		1300	226
1450	28	215	51	1430	19	236	36	1456	16	280	25		1400	11.2	254		1400	169
1550	37	234	51	1510	16	252	33	1556	29	270	39		1500	12.5	282		1500	237
1650	33	230	52	1600	11	291	23	1656	17	310			1600	16.3	284		1600	254
1750	29	222	50	1710	13	299	25	1756	18	230			1700	15.8	276		1700	321
1850	32	223	50	1830	12	312	23	1856	10	240			1800	14.5	269		1800	274
1950	32	236	61	1920	20	301	40	1954	21	250	25		1900	11.6	268		1900	186
2050	31	227	56	2000	18	297	27	2056	18	230			2000	17.8	267		2000	479
2150	27	225	51	2150	15	277	30	2128	24	230	33		2100	14.4	262		2100	746
2250	34	240	55	2250	15	300	30	2256	7	250			2200	18.5	262		2200	616
2350	26	232	50	2330	21	298	43	2357	32	260	45		2300	14.1	261		2300	153

*Wind data for KNJK from the NCEI's QCLCD system. Wind data for Sunrise-Ocotillo (IMPSD) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. El Centro station does not measure wind gusts. Wind speeds = mph; Direction = degrees. BLDU = blowing dust. Blue signifies December 15, 2016.

TABLE 5-4
UPSTREAM WIND SPEEDS AND NILAND PM₁₀ CONCENTRATIONS

Ocotillo Wells (AS938/KD6RSQ5)				Borrego Springs (BRGSD)				El Centro NAF (KNJK)					Niland				Niland FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	Obs.	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
2100	7	300	11	2100	6	29	12	2156	24	260	38	BLDU	2100	7.1	145		2100	57
2200	15	320	25	2200	11	282	39	2256	18	270	32	BLDU	2200	4.6	186		2200	49
2300	16	323	29	2300	6	20	12	2356	18	290			2300	3.6	245		2300	174
029	18	329	29	000	3	80	5	56	20	320	32		0000	6.7	243		0000	325
130	19	334	35	100	5	99	7	156	24	250			0100	15.6	278		0100	104
214	14	316	23	200	4	41	9	256	20	250			0200	9.1	280		0200	9
315	13	313	19	300	3	217	5	356	11	320			0300	16.1	231		0300	218
405	5	326	12	400	5	177	8	456	13	270			0400	8.6	245		0400	235
505	3	319	8	500	5	86	8	556	5	280			0500	8.3	224		0500	158
615	18	309	32	600	8	136	12	656	5	VR			0600	11.4	207		0600	392
725	17	316	30	700	9	73	15	756	8	220			0700	10.7	143		0700	115
825	14	327	22	840	13	225	36	856	6	VR			0800	9	129		0800	283
907	18	336	30	950	7	330	24	956	34s	250	39	BLDU	0900	18.1	208		0900	325
1010	18	310	29	1040	19	277	50	1007	33	250	44	BLDU	1000	24.5	214		1000	591
1110	15	317	36	1110	22	305	42	1156	24	270			1100	25.8	215		1100	960
1244	14	316	32	1210	18	266	42	1256	25	270			1200	22.7	211		1200	642
1335	13	310	28	1320	25	268	37	1356	28	280			1300	19.4	219		1300	438
1430	22	331	36	1400	18	284	28	1456	16	280	25		1400	16.2	266		1400	492
1520	25	319	37	1530	18	290	28	1556	29	270	39		1500	29	266		1500	995
1600	23	2	35	1630	8	3	16	1656	17	310			1600	26.9	261		1600	
1724	23	317	43	1720	8	44	22	1756	18	230			1700	27.6	256		1700	995
1855	29	292	50	1800	7	50	20	1856	10	240			1800	26.8	259		1800	995
1925	35	330	59	1910	12	356	23	1954	21	250	25		1900	33.8	249		1900	
2012	32	317	53	2010	12	5	20	2056	18	230			2000	24.4	262		2000	995
2110	24	306	41	2130	10	311	29	2128	24	230	33		2100	28.8	256		2100	926
2215	24	298	38	2230	20	287	35	2256	7	250			2200	32.8	258		2200	995
2305	22	307	36	2300	19	274	32	2357	32	260	45		2300	26.1	254		2300	462

*Wind data for KNJK from the NCEI's QCLCD system. Wind data for Borrego Springs (BRGSD) and Ocotillo Wells (AS938/KD6RSQ5) from the University of Utah's MesoWest system. Niland station does not measure wind gusts. Wind speeds = mph; Direction = degrees. BLDU = blowing dust. Blue signifies December 15, 2016.

TABLE 5-5
UPSTREAM WIND SPEEDS AND WESTMORLAND PM₁₀ CONCENTRATIONS

Ocotillo Wells (AS938/KD6RSQ5)				Borrego Springs (BRGSD)				El Centro NAF (KNJK)					Fish Creek Mtns. (FHCC1)				Westmorland FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	Obs.	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
2150	7	300	11	2100	6	29	12	2156	24	260	38	BLDU	2126	3	254	12	2100	116
2250	15	320	25	2200	11	282	39	2256	18	270	32	BLDU	2226	5	260	10	2200	146
2350	16	323	29	2300	6	20	12	2356	18	290			2326	8	168	15	2300	396
050	18	329	29	000	3	80	5	56	20	320	32		026	8	208	19	0000	218
150	19	334	35	100	5	99	7	156	24	250			126	17	223	34	0100	375
250	14	316	23	200	4	41	9	256	20	250			226	18	214	35	0200	
350	13	313	19	300	3	217	5	356	11	320			326	17	214	29	0300	
450	5	326	12	400	5	177	8	456	13	270			426	18	198	32	0400	344
550	3	319	8	500	5	86	8	556	5	280			526	13	164	24	0500	185
650	18	309	32	600	8	136	12	656	5	VR			626	6	125	21	0600	541
750	17	316	30	700	9	73	15	756	8	220			726	6	78	13	0700	577
850	14	327	22	840	13	225	36	856	6	VR			826	14	154	19	0800	960
950	18	336	30	950	7	330	24	956	34s	250	39	BLDU	926	2	71	17	0900	995
1050	18	310	29	1040	19	277	50	1007	33	250	44	BLDU	1026	11	225	22	1000	995
1150	15	317	36	1110	22	305	42	1156	24	270			1126	12	208	28	1100	995
1250	14	316	32	1210	18	266	42	1256	25	270			1226	18	194	33	1200	
1350	13	310	28	1320	25	268	37	1356	28	280			1326	17	197	30	1300	885
1450	22	331	36	1400	18	284	28	1456	16	280	25		1426	17	194	32	1400	995
1550	25	319	37	1530	18	290	28	1556	29	270	39		1526	8	306	31	1500	995
1650	23	2	35	1630	8	3	16	1656	17	310			1626	9	288	34	1600	
1750	23	317	43	1720	8	44	22	1756	18	230			1726	9	328	34	1700	995
1850	29	292	50	1800	7	50	20	1856	10	240			1826	6	27	35	1800	
1950	35	330	59	1910	12	356	23	1954	21	250	25		1926	11	307	29	1900	
2050	32	317	53	2010	12	5	20	2056	18	230			2026	16	285	33	2000	
2150	24	306	41	2130	10	311	29	2128	24	230	33		2126	15	301	34	2100	995
2250	24	298	38	2230	20	287	35	2256	7	250			2226	12	313	40	2200	677
2350	22	307	36	2300	19	274	32	2357	32	260	45		2326	14	271	41	2300	

* Wind data for KNJK from the NCEI's QCLCD system. Wind data for Borrego Springs (BRGSD), Ocotillo Wells (AS938/KD6RSQ5), and Fish Creek Mountains (FHCC1) from the University of Utah's MesoWest system. Westmorland station does not measure wind gusts. Wind speeds = mph; Direction = degrees. BLDU = blowing dust. Blue signifies December 15, 2016.

Figure 5-7 is a graphic depiction which provides a general timeline of entrainment during the December 16, 2016 exceptional event by combining a 12-hour HYSPLIT back-trajectory with key upstream wind speeds and corresponding PM₁₀ concentrations in the hours leading up to and during the peak concentrations. The trajectory ends at 2100 PST. This was during the hour that El Centro reached peak PM₁₀ concentrations. The Brawley and Westmorland monitors reached

995 $\mu\text{g}/\text{m}^3$ early in the morning and continued to reach that peak periodically during the day.

Niland and Calexico reached their hourly maximums at 1500 and 2000, respectively, although each reported equally high hourly concentrations into the evening and night. Although Brawley, Calexico, Niland and Westmorland experienced peak concentrations earlier in the day, all monitors were still significantly elevated during this period. Brawley, Niland, and Westmorland all had elevated hourly concentrations late on December 15, 2016 due to a brief spurt of strong northwest gusts. The elevated concentrations carried through into the first few hours of December 16, 2016 when gusty winds continued from the northwest. Calexico and El Centro, farther south, had elevated concentrations but were not affected as much by the northwest winds. Later, toward noon on December 16, 2016, wind direction shifted westerly as wind speed and gusts ramped. Dust was entrained from arid desert soils beyond Imperial County. The San Diego County deserts were under a High Wind Warning¹⁴ with expectations of blowing sand and dust. Imperial County was under a Wind Advisory¹⁵. Blowing dust was observed for several hours at El Centro NAF.

¹⁴ A High Wind Warning is issued when the following conditions are expected: 1) sustained winds of 40 mph or higher for one hour or more, or; 2) wind gusts of 58 mph or higher for any duration. Source: <https://www.weather.gov/lwx/WarningsDefined>.

¹⁵ A Wind Advisory is issued when the following conditions are expected: 1) sustained winds of 31 to 39 mph for an hour or more, and/or; 2) wind gusts of 46 to 57 mph for any duration. Source: <https://www.weather.gov/lwx/WarningsDefined>.

FIGURE 5-7
EXCEEDANCE TIMELINE – DECEMBER 16, 2016

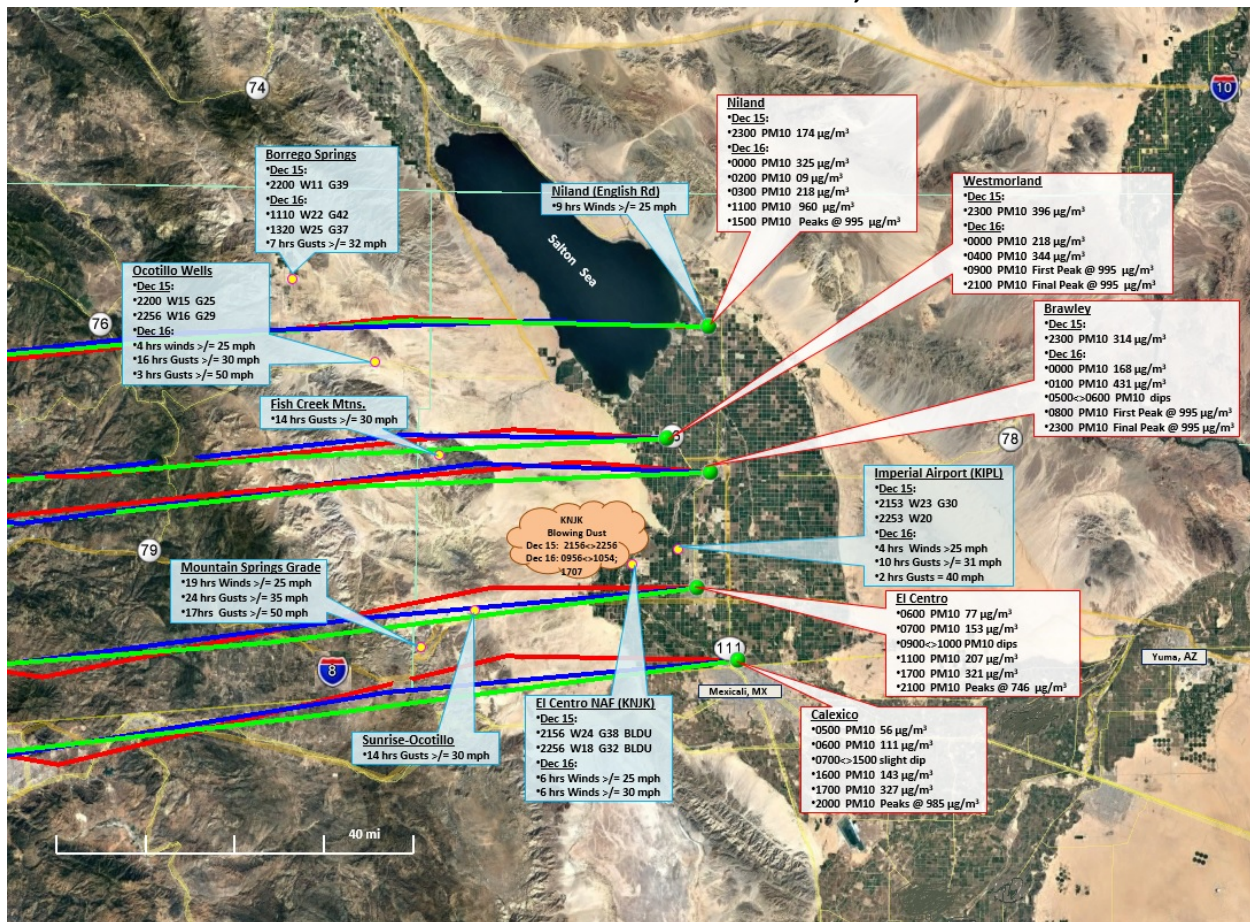


Fig 5-7: The 12-hour HYSPLIT trajectories show the path of the air parcel ending at all stations at 2100 PST on December 16, 2016. Red trajectory indicates air flow at 10 meters AGL (above ground level); blue indicates air flow at 100m; green is 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 5-8 and Figure 5-12 depict PM₁₀ concentrations and wind speeds over a 72-hour period at Brawley, Calexico, El Centro, Niland, and Westmorland. Fluctuations in hourly concentrations at the monitor over 72 hours shows a positive correlation with elevated wind speeds and gusts at upstream sites.

FIGURE 5-8
BRAWLEY PM₁₀ CONCENTRATIONS & WIND SPEED CORRELATION

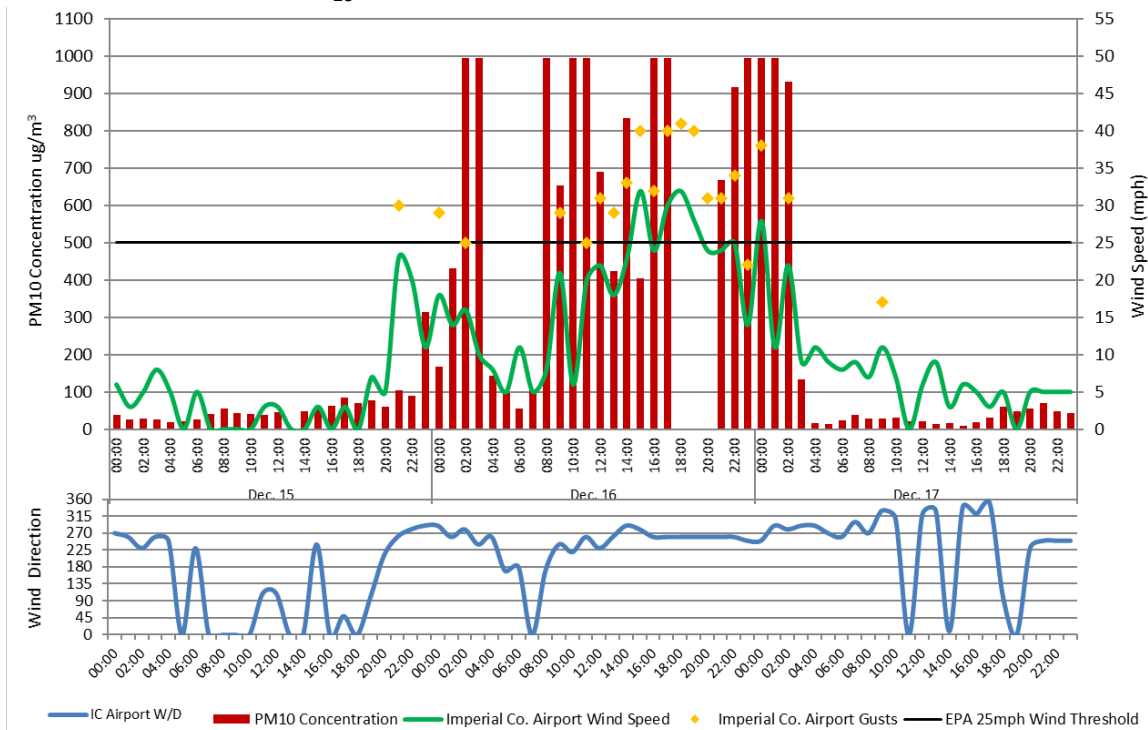


Fig 5-8: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds, and particularly gusts. Brawley station does not measure wind. Imperial County Airport is the closest meteorological site. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

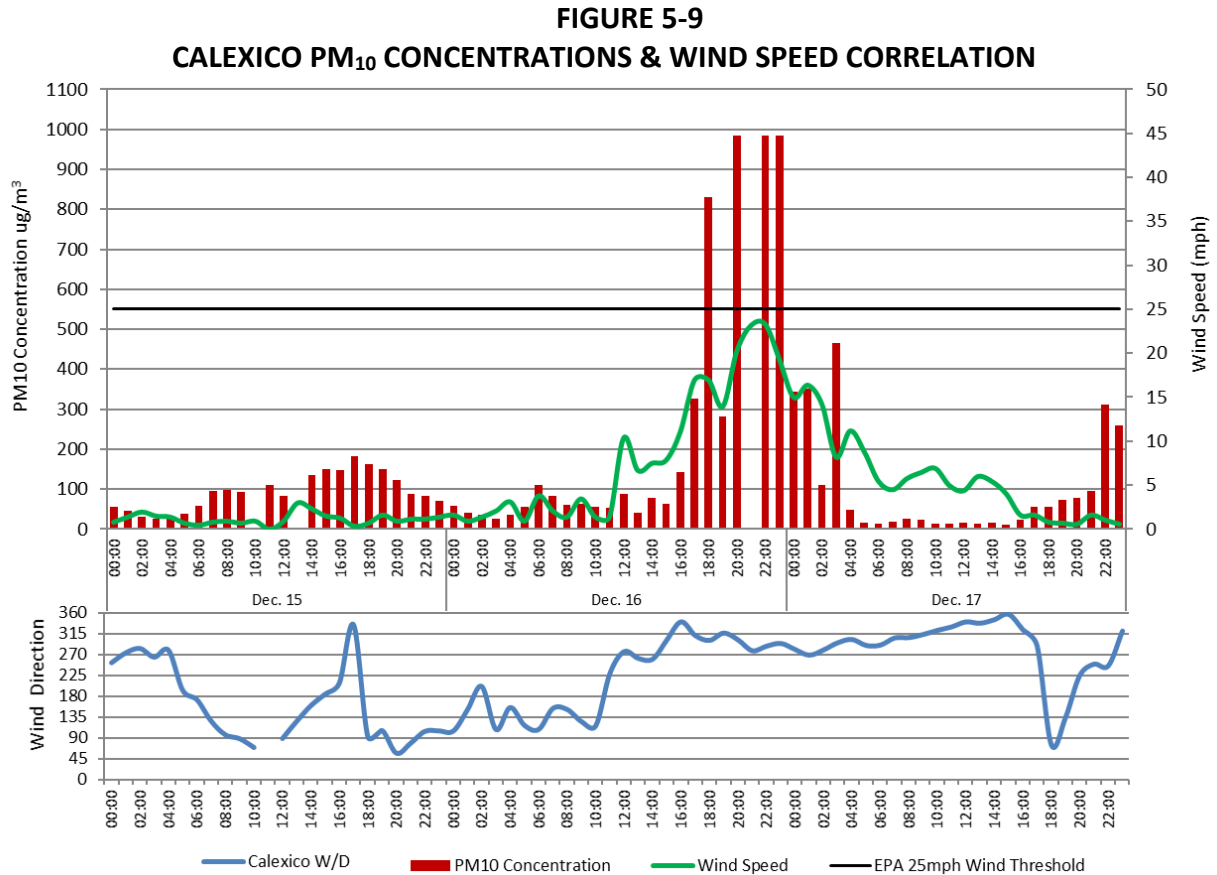


Fig 5-9: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds. Although the station did not have winds above the 25mph threshold, the lower wind speeds allowed for a deposition of dust on the monitor due to the dust entrained by higher winds upstream. Calexico station does not measure gusts. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

FIGURE 5-10
EL CENTRO PM₁₀ CONCENTRATIONS & WIND SPEED CORRELATION

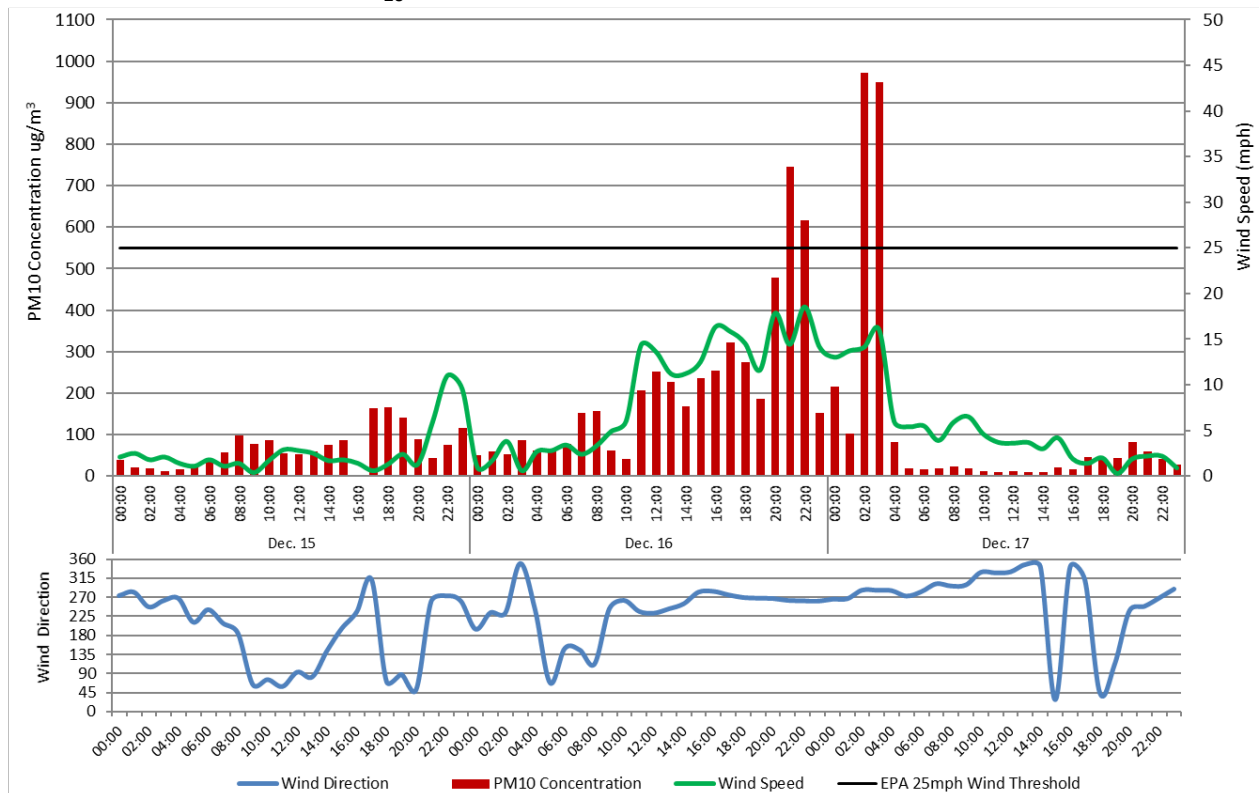


Fig 5-10: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds. Although the station did not have winds above the 25 mph threshold, the lower wind speeds allowed for a deposition of dust on the monitor due to the dust entrained by higher winds upstream. El Centro station does not measure gusts. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

FIGURE 5-11
NILAND PM₁₀ CONCENTRATIONS & WIND SPEED CORRELATION

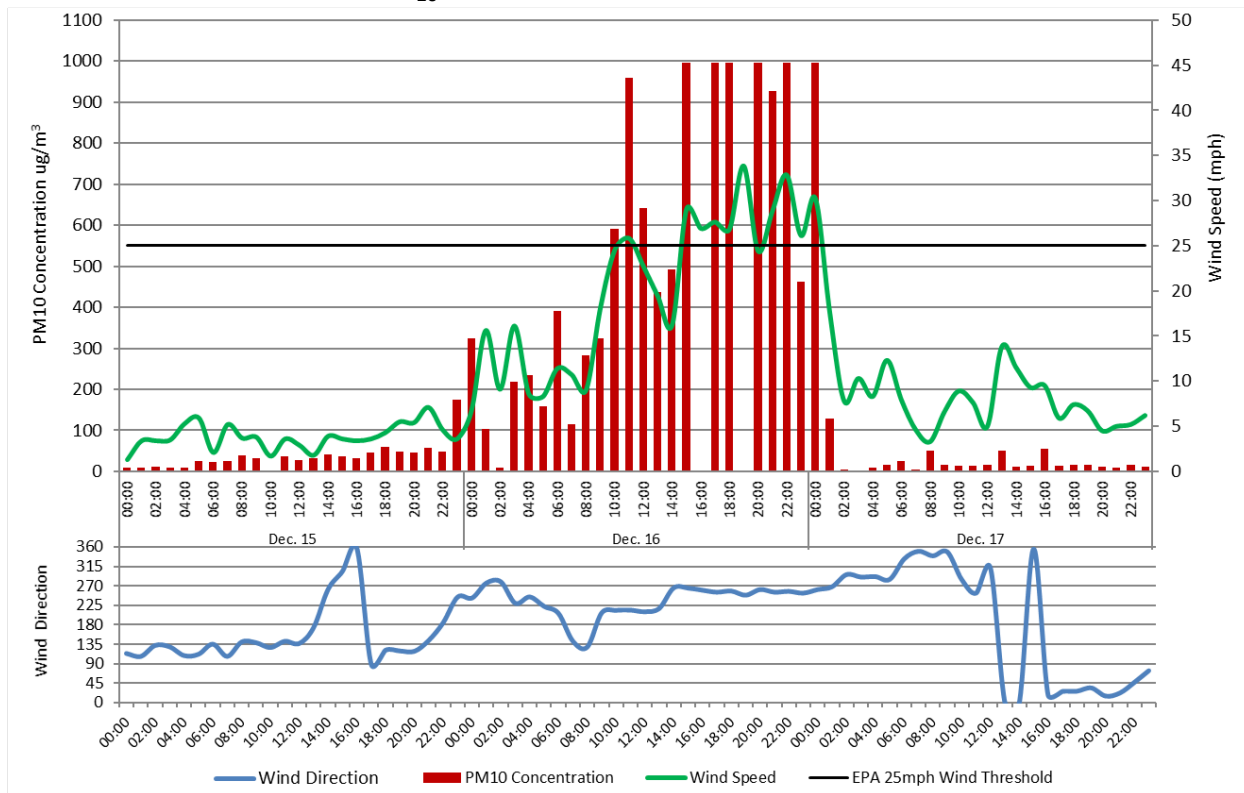


Fig 5-11: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds that were over the 25 mph threshold. Niland station does not measure gusts. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

FIGURE 5-12
WESTMORLAND PM₁₀ CONCENTRATIONS & WIND SPEED CORRELATION

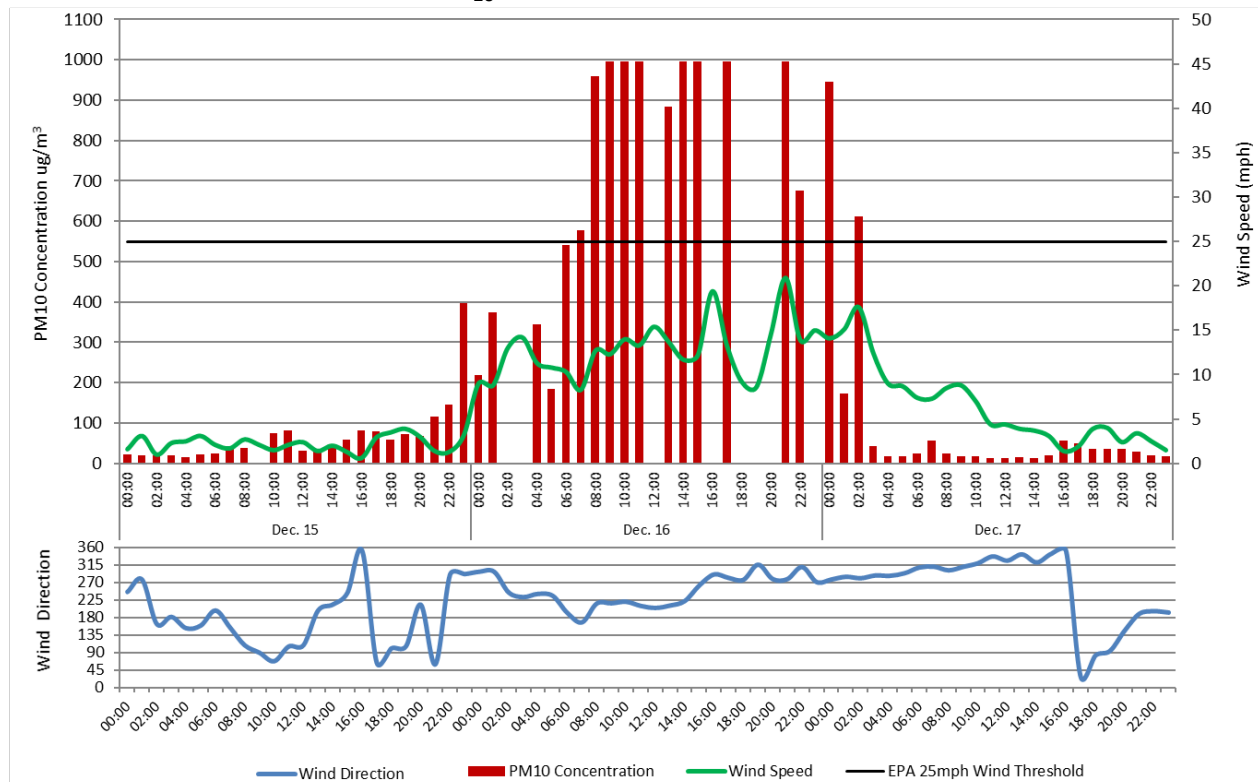


Fig 5-12: Fluctuations in hourly concentrations over 72 hours show a positive correlation with wind speeds. Although the station did not have winds above the 25 mph threshold, the lower wind speeds allowed for a deposition of dust on the monitor due to the dust entrained by higher winds upstream. Westmorland station does not measure gusts. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

Figure 5-13 depicts the relationship between the 72-hour PM₁₀ fluctuations by the Brawley, Calexico, El Centro, Niland, and Westmorland monitors together with upstream wind speeds. A positive correlation can be seen between an increase in wind speeds and gusts with increased concentrations at the monitors. It also more clearly shows the differences in PM₁₀ concentrations at critical times during December 16, 2016 as concentrations rose late on December 15, 2016 and early December 16, 2016 in response to dust transported into the area by elevated northwest winds, the ensuing dip in winds speeds, and the ramping up of winds as wind direction became soundly westerly. **Appendix C** contains additional graphs illustrating the relationship between PM₁₀ concentrations and wind speeds from region monitoring sites within Imperial County, eastern Riverside County, and Yuma, Arizona during the wind event.

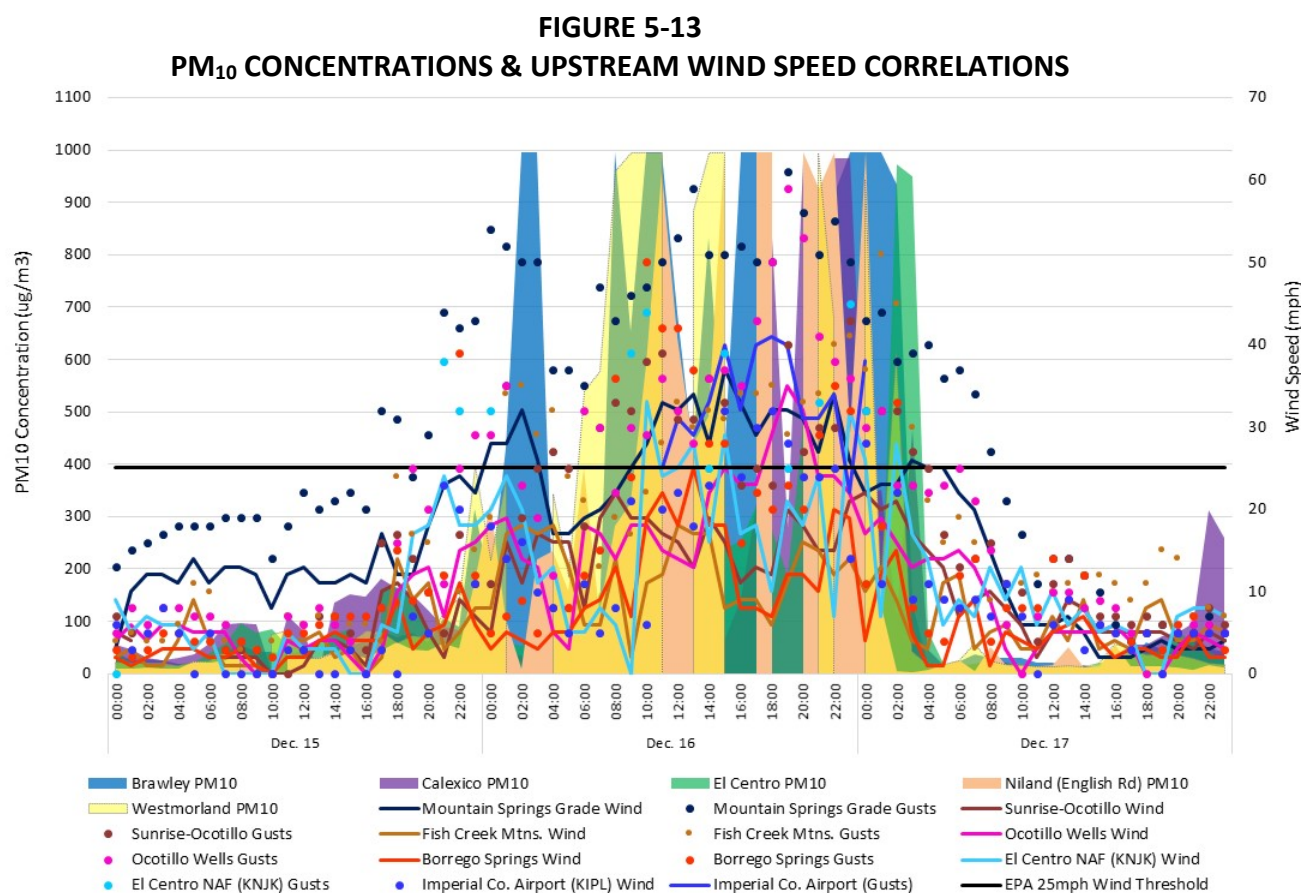


Fig 5-13: This graph depicts a positive correlation between an increase in upstream wind speeds and PM₁₀ fluctuations by the Brawley, El Centro, and Westmorland monitors over 72-hours. Black line indicates the 25 mph threshold

Figure 5-14 compares the 72-hour concentrations at Brawley, Calexico, El Centro, Westmorland, and Niland with visibility¹⁶ at local airfields between December 15, 2016 and December 17, 2016. Generally, drops in visibility correspond to highest hourly concentrations at the monitors.

¹⁶ According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can “see”. The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; <http://www.nws.noaa.gov/asos/vsby.htm>.

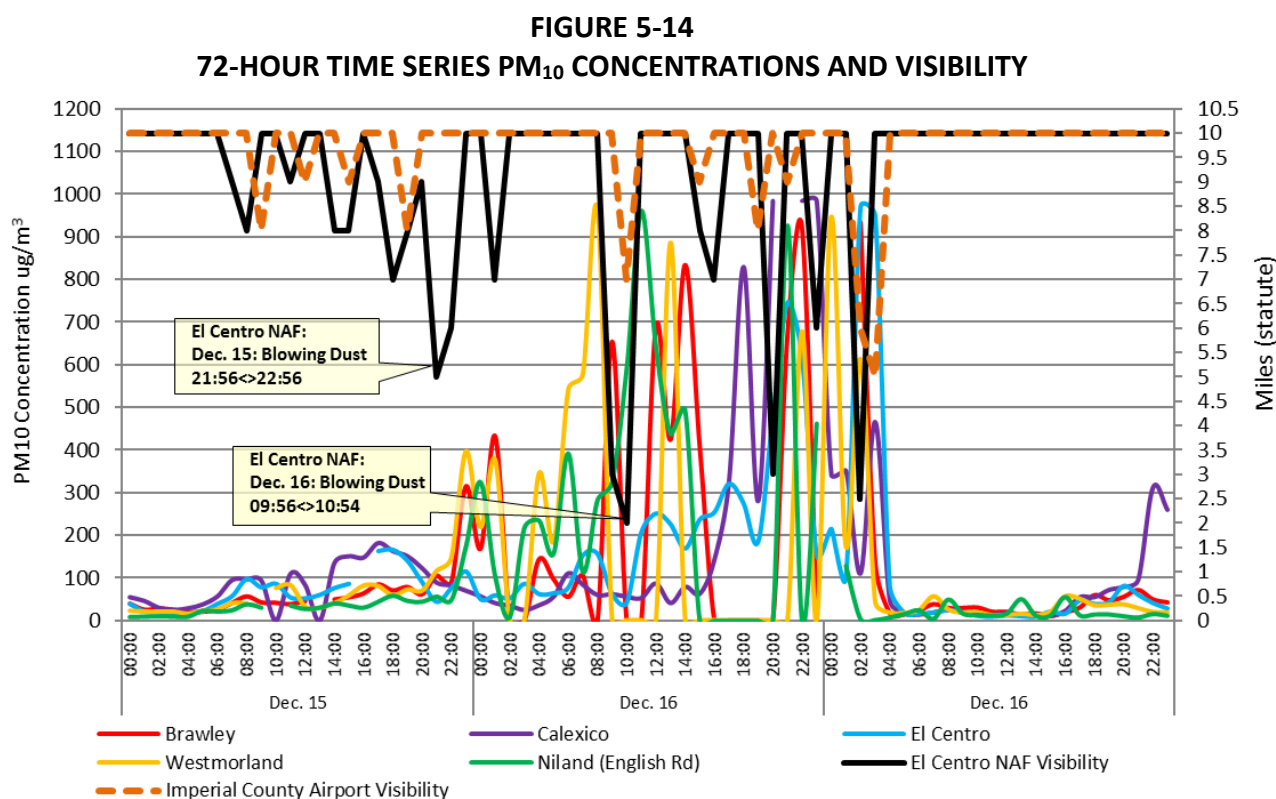


Fig 5-14: Visibility as reported from Imperial County Airport (KIPL) and El Centro NAF (KNJK) show that visibility dipped significantly at the airfields coincident to peak concentrations at Brawley, Calexico, El Centro, Niland, and Westmorland. Visibility data from the NCEI's QCLCD data bank

The powerful gusts transported dust from the San Diego County mountains and desert areas over agricultural lands in Imperial County. On December 15, 2016 the ICAPCD issued on its website an Air Quality Forecast notifying the public that on December 16, 2016 an upper level trough of low pressure would move through the Imperial County, generating moderate and gusty west-southwesterly winds at the surface, and that these winds would lead to areas of blowing dust, resulting in high to moderate AQI levels. **Figures 5-15 through 5-19** show the resulting air quality indices¹⁷ in Brawley, Calexico, El Centro, Niland, and Westmorland during December 16, 2016 due to the dust transported into Imperial County by the high winds. At Brawley (**Fig. 5-15**) air quality was already in the "Yellow" or Moderate category (PM₁₀ 51-100 µg/m³) at 1 a.m. By 2

¹⁷ The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: <https://www.airnow.gov/index.cfm?action=aqibasics.aqi>

p.m. air quality had slid into the “Orange” or Unhealthy for Sensitive Groups level (PM₁₀ 101-150 $\mu\text{g}/\text{m}^3$). At 5 p.m. it dropped even further into the “Red” or Unhealthy category (PM₁₀ 151-200 $\mu\text{g}/\text{m}^3$) where it remained until moving back into the Orange level at 7 p.m. where it remained until 8 p.m. At 9 p.m. air quality improved marginally and was categorized as Moderate. At Calexico (**Fig. 5-16**) air quality remained in the Moderate category the entire day. Air quality at El Centro (**Fig. 5-17**) was listed as Moderate until entering the Unhealthy for Sensitive Groups level at 11 p.m. where it remained for the rest of the day. Air quality in Niland (**Fig. 5-18**) was considered “Green” or Good (PM₁₀ 0-51 $\mu\text{g}/\text{m}^3$) from 1 a.m. to 2 a.m. At 3 a.m. air quality dropped into the Moderate range and at 1 p.m. it fell further into the Unhealthy for Sensitive Groups level. At 6 p.m. air quality slid into the Unhealthy level where it remained until 10 p.m. At 11 p.m. air quality dropped into the “Purple” or Very Unhealthy level (PM₁₀ 201-300 $\mu\text{g}/\text{m}^3$). At 12 a.m. air quality had improved considerably and was considered Good. Westmorland (**Fig. 5-19**) began the day with air quality in the Moderate range between 1 a.m. and 8 a.m. At 9 a.m. air quality fell into the Unhealthy for Sensitive Groups level where it remained through 2 p.m. At 3 p.m. air quality dropped into the Unhealthy level. Between 4 p.m. and 5 p.m. air quality improved and was listed as Good. But at 6 p.m. air quality fell back into the Moderate range where it remained for the rest of the day. Aside from the air quality indices posted on the ICAPCD website, Air Quality Alerts were issued periodically throughout the day. At 8 a.m. an alert was issued notifying the public that air quality in the Westmorland area had reached 109 $\mu\text{g}/\text{m}^3$ and was considered Unhealthy for Sensitive Groups. At 10 p.m. an alert was issued notifying the public that air quality in the Niland area had reached 204 $\mu\text{g}/\text{m}^3$ and was considered Very Unhealthy. **Appendix A** contains copies of notices as they were issued either as forecast information prior to or on December 16, 2016.

FIGURE 5-15
IMPERIAL VALLEY AIR QUALITY INDEX IN BRAWLEY
DECEMBER 16, 2016

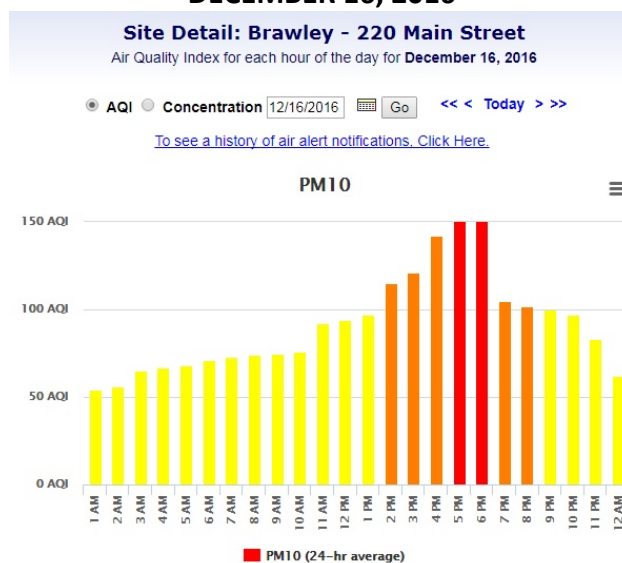


Fig. 5-15: The reduced air quality in Brawley shows that the fugitive dust transported by high winds affected the air quality of the Imperial County. Source: ICAPCD archives.

FIGURE 5-16
IMPERIAL VALLEY AIR QUALITY INDEX IN CALEXICO
DECEMBER 16, 2016
PM10

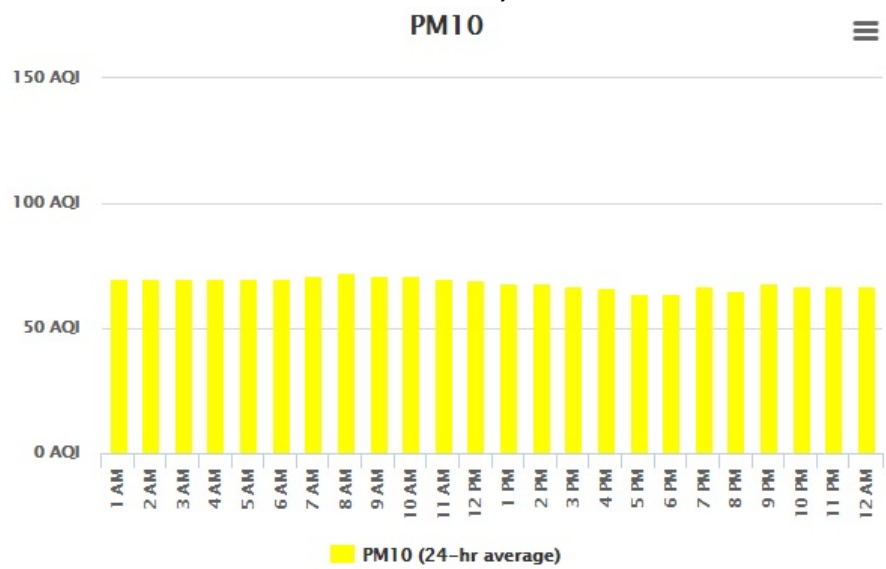


Fig. 5-16: The reduced air quality in Calexico shows that the fugitive dust transported by high winds affected the air quality of the Imperial County. Source: ICAPCD archives.

FIGURE 5-17
IMPERIAL VALLEY AIR QUALITY INDEX IN EL CENTRO
DECEMBER 16, 2016
PM10

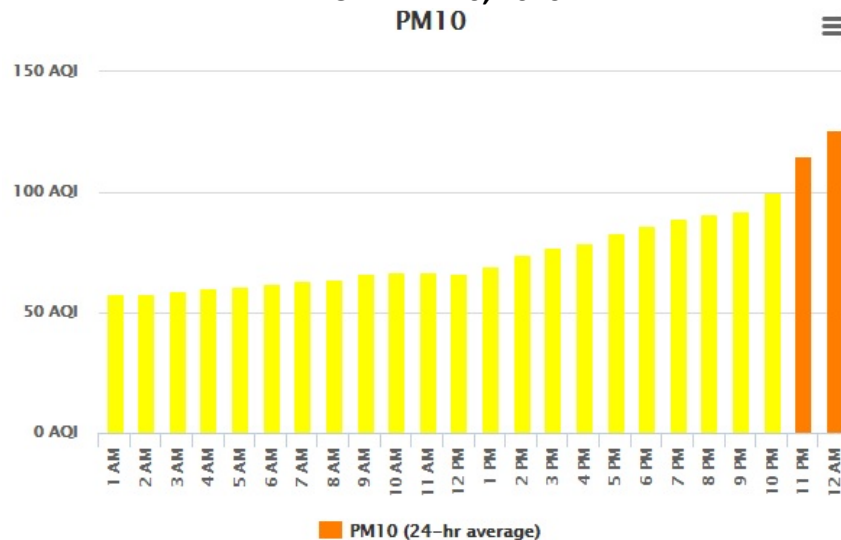


Fig. 5-17: The reduced air quality in El Centro shows that the fugitive dust transported by high winds affected the air quality of the Imperial County. Source: ICAPCD archives.

FIGURE 5-18
IMPERIAL VALLEY AIR QUALITY INDEX IN NILAND
DECEMBER 16, 2016

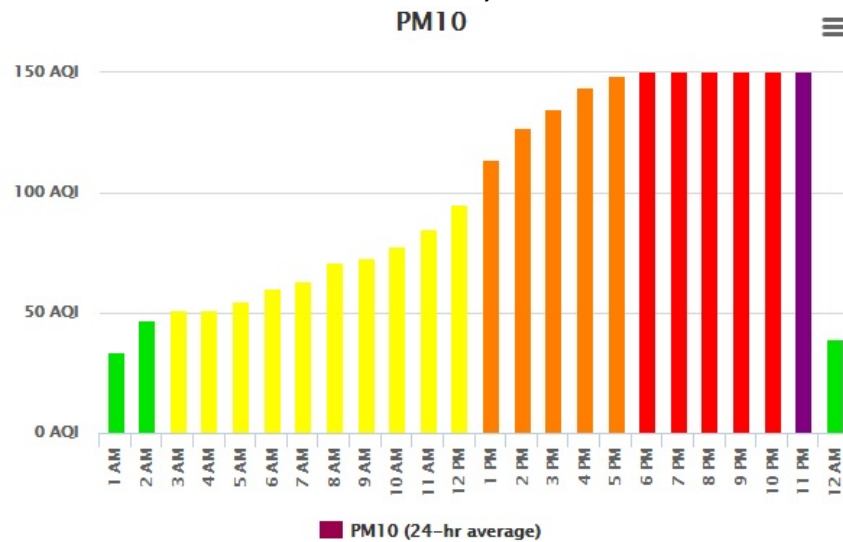


Fig. 5-18: The reduced air quality in Niland shows that the fugitive dust transported by high winds affected the air quality of the Imperial County. Source: ICAPCD archives.

FIGURE 5-19
IMPERIAL VALLEY AIR QUALITY INDEX IN WESTMORLAND
DECEMBER 16, 2016

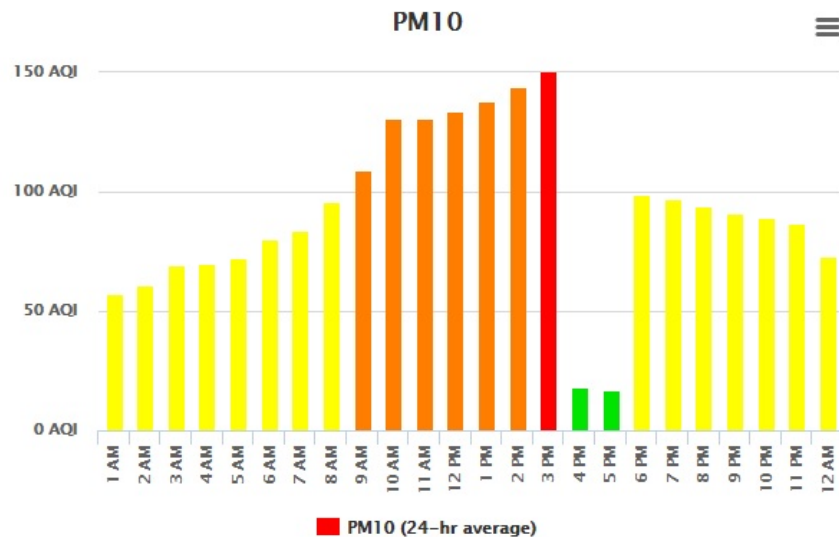


Fig. 5-19: The reduced air quality in Westmorland shows that the fugitive dust transported by high winds affected the air quality of the Imperial County. Source: ICAPCD archives.

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the powerful winds associated with the low pressure system that moved through the region. The information provides a clear causal relationship between the entrained windblown dust and the PM₁₀ exceedance measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors on December 16, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the southwest portion of Yuma County, Arizona, all of Imperial County, and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM₁₀ were carried aloft by strong westerly winds into the lower atmosphere causing a change in the air quality conditions within Imperial County. Windblown dust from the San Diego mountain and deserts blew into and over the desert floor and agricultural lands in Imperial County. Combined, the information demonstrates that the elevated PM₁₀ concentrations measured on December 16, 2016 coincided with high wind speeds and that gusty west winds were experienced over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-20
DECEMBER 16, 2016 WIND EVENT TAKEAWAY POINTS

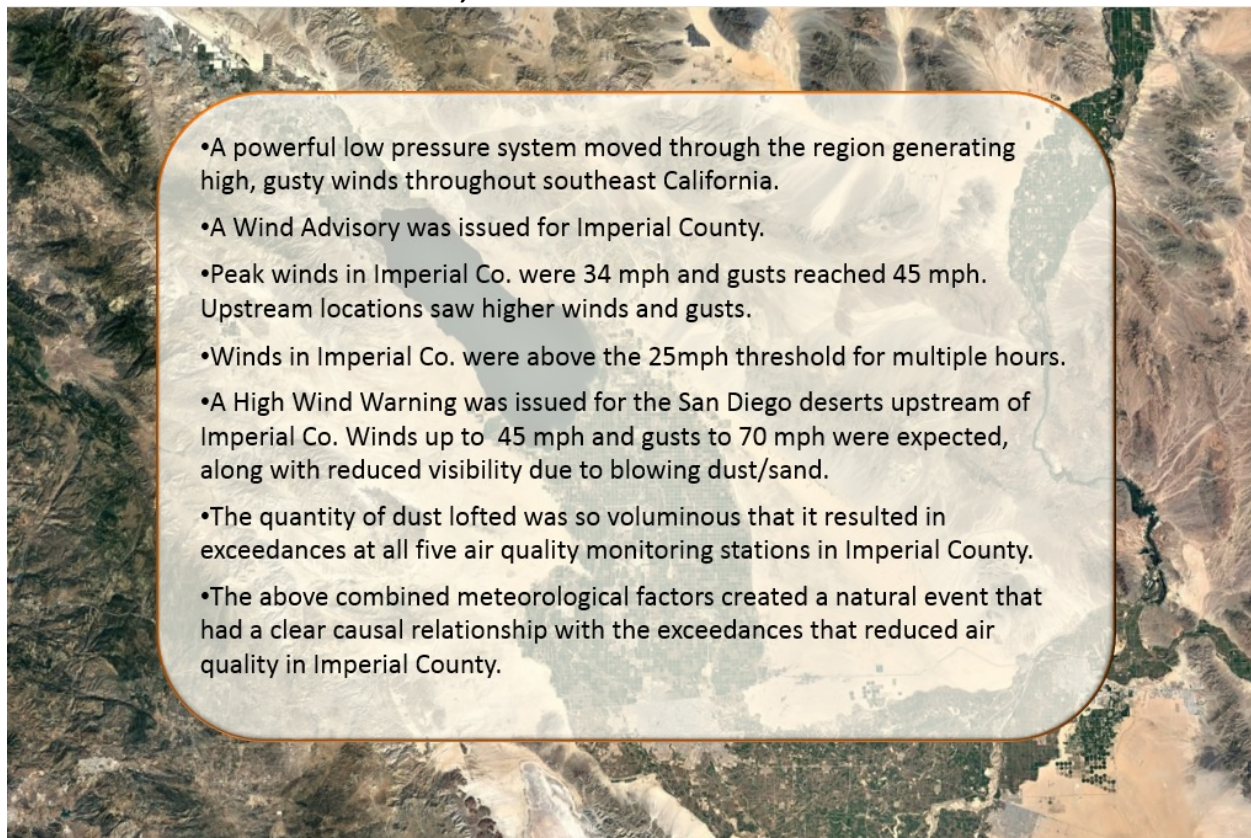


Fig. 5-20: Illustrates the factors that qualify the December 16, 2016 natural event which affected air quality as an Exceptional Event.

VI Conclusions

The PM₁₀ exceedance that occurred on December 16, 2016, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST		
EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM ₁₀)		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-31; 82
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	56-80; 82
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	32-48; 82
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	49-55; 81
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	56-80; 82

VI.1 Affects Air Quality

The preamble to the revised EER states that an event is considered to have affected air quality if it can be demonstrated that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the December 16, 2016 event which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be “not reasonably controllable or preventable.” The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. The nRCP is met for natural events where high wind events entrain dust from desert areas, whose sources are controlled by BACM, where human activity played little or no direct

causal role. This demonstration provides evidence that despite BACM in place within Imperial County, high winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM₁₀ exceedance measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors were caused by naturally occurring strong gusty west winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert regions to the west of Imperial County. These facts provide strong evidence that the PM₁₀ exceedances at Brawley, Calexico, El Centro, Niland, and Westmorland on December 16, 2016 were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a “Natural Event” (50.1(k) of 40 CFR Part 50) is an event and its resulting emissions, which may recur at the same location where anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions, thus meeting the criteria that human activity played little or no direct causal role. As discussed within this demonstration, the PM₁₀ exceedances that occurred at Brawley, Calexico, El Centro, Niland, and Westmorland on December 16, 2016 were caused by the transport of fugitive dust into Imperial County by strong westerly winds associated with a low pressure system that moved over the region. At the time of the event anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM₁₀ concentrations at Brawley during different days, and the comparative analysis of different areas in Imperial and Riverside county monitors demonstrates a consistency of elevated gusty west winds and concentrations of PM₁₀ at the Brawley, Calexico, El Centro, Niland, and Westmorland monitoring stations on December 16, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM₁₀ concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM₁₀ concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on December 16, 2016

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM₁₀ values measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains forecasts issued by the National Weather Service and Imperial County on or around December 16, 2016. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM₁₀ concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional effect of the wind event.

Appendix C: Correlated PM₁₀ Concentrations and Winds.

This Appendix contains the graphs depicting the correlations between PM₁₀ Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide affect of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.